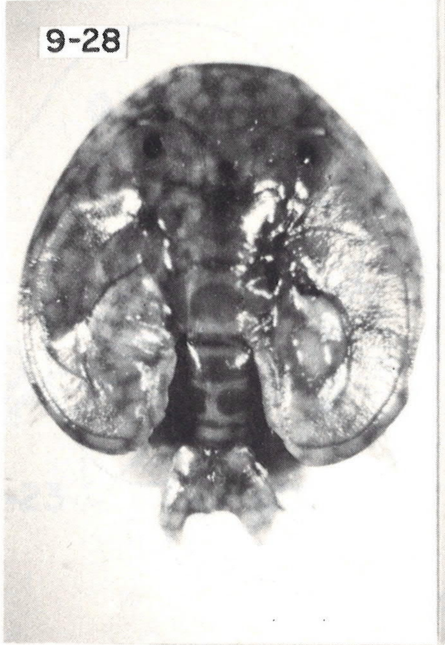
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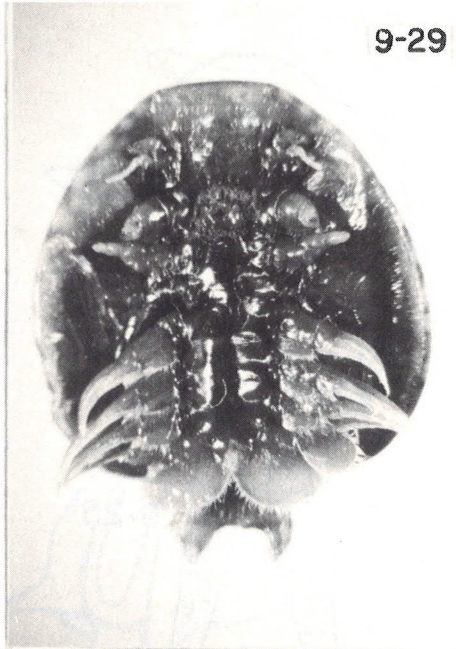
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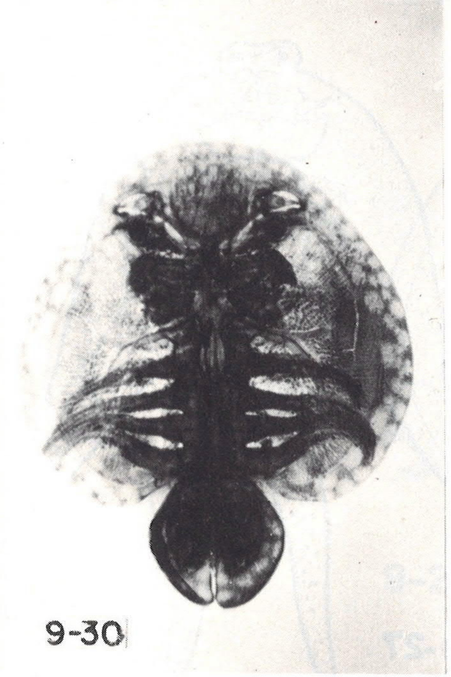
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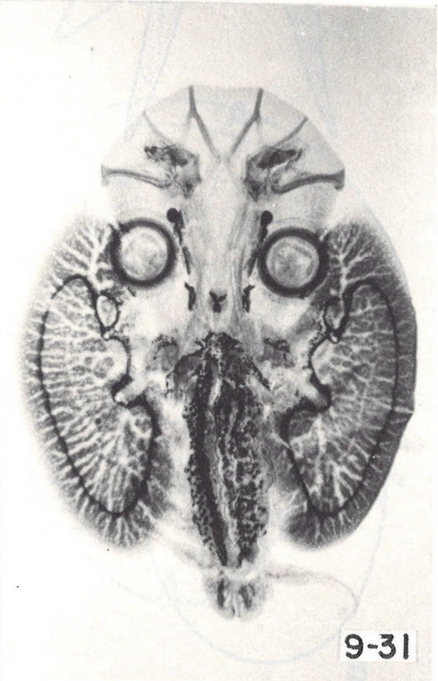
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10. Isopoda

I. Definition and morphology

Isopods are dorso-ventrally flattened crustaceans found in marine, terrestrial and freshwater habitats. The name isopod means "equal legs" and most species have a free thorax (pereon) of seven similar segments (pereomeres) each of which bears a pair of similar legs (pereopods). The most familiar isopods are commonly known as "sow bugs" or "pill bugs" and these are found in damp terrestrial habitats. Most of the fish parasitic isopods belong to the family Cymothoidae, but the family Excorallanidae also occurs on Amazonian fish. The parasitic isopods have from four to seven pairs of walking legs modified for grasping and each of these is provided with a stout claw.

Most free living isopods are bottom feeding aquatic scavengers. Some eat detritus and carrion, while others are more predatory. Many have one or two pairs of prehensile legs anteriorly to aid in grasping food. Those that evolved more pairs of prehensile legs and stronger claws were able to cling to fully active fish and make the transition to parasitism.

II. Life-cycle and transmission

In isopods, the sexes are separate and fertilization is internal. Both male and female cymothoids are found on fish, frequently together. It is believed that all cymothoids go through a male stage first and then some go on to become females (which would make them protandrous hermaphrodites). According to this idea, the first young cymothoid to arrive on a fish, and finding itself alone, would pass rapidly through the male stage and become a female. The second to arrive would find a female in residence and hence remain a male. This could be caused by hormonal inhibitors. In any case, adult females are easy to recognize because they have the entire ventral surface covered by a marsupium formed from medial flap-like extensions of the coxae. The eggs are laid in and retained within the marsupium. There they develop into fully functional young cymothoids and eventually go out into the world through a slit-like posterior pore.

Young cymothoids swim actively and are ready to attack small fish as soon as they leave the marsupium. In Amazonian waters, it is not uncommon to find small cymothoids clinging to and feeding on small fish. In the laboratory, we have been able to observe the hunting behavior of young cymothoids. At first, they swim rapidly and in very straight horizontal lines. Their swimming posture is with the head forward to the direction of movement and the dorsal side up. The swimming activity lasts for only 30 to 60 seconds after which they suddenly become immobile and sink to the bottom as though dead, with the dorsal side down and the legs pointed upward and spread wide apart. They are capable of waiting motionless in this position for hours. If a fish goes to investigate, or happens to swim by closely, the apparently dead cymothoid springs its trap. The legs are all snapped inward towards the midline, and the claws (dactyls) are engaged in the fish which then swims off with a passenger.

After a young cymothoid has attached itself to a small fish, it begins to feed at once. They frequently position themselves on the ventral surface of the fish at the level of the pectoral fins. Wherever they happen to be, they rasp out tissue and frequently, the pectoral fins are entirely devoured.

The under sides of the opercula are also eaten, and if the fish is small, it soon succumbs to such an attack. When a fish dies, the young cymothoid loses interest in it and swims off in search of a live fish. We have seen a single young cymothoid kill and devour portions of as many as four small fish in a 24 hour period. After young cymothoids grow larger, they must find a permanent host for they lose their swimming ability. Adult males detached from the fish can crawl slowly on the bottom, but females with a marsupium full of young can not move about.

III. Pathology

The pathogenicity of isopods varies according to position on or in the host, feeding behavior, attachment strategy and size. Four sites are utilized on host fish, namely: the skin or fins, the gill chambers, the mouth (on top of the tongue) and hollows or pouches which they make within the body cavity. Each of these sites suffers some modifications from the presence of isopods so they will be considered separately.

Of the South American species reported from freshwater hosts, only *Nerocila armata* is normally found on the skin. These ectoparasites cause considerable damage to their hosts and are believed to feed on blood, mucous and epithelial cells. They sometimes perforate the skin of the fish or devour portions of the fins. They may cause primary anemia from blood loss, and the lesions they provoke may open the way for secondary invaders such as bacteria and fungi.

Isopods that inhabit the gill chambers of fish feed largely on gill filaments. BRUSCA (1978) reported lysed red blood cells in the intestines of males of a marine species taken from such a site. In addition to blood loss, a reduction in the number of gill filaments decreases respiratory efficiency and thereby affects metabolism and growth. ROMESTAND & TRILLES (1979) in experimental studies with marine fish infested with isopods found that the parasites caused delayed growth in the hosts.

The role of isopods living on the tongues of fish is more difficult to assess. Although the tongues of hosts may be reduced in size or indented, there is no direct evidence to indicate that the missing tissue has been eaten. ROMESTAND & TRILLES (1977) found as much as half the tongues of infected hosts to be lacking. The missing tissues included epidermis, cartilage and some bone. They considered these tongues to be atrophied or degenerated.

The nutritional habits of tongue inhabiting isopods have been questioned. BRUSCA (1978) found the intestinal tracts of cymothoid females from tongue sites to be entirely empty. The same author (1981) suggested, "that females are largely (or perhaps entirely) non-feeding and hence are best considered obligate commensals". He further proposed that these females use nutritional reserves from previous male instars for reproductive energy. This would appear to be an incredible suggestion, but an even more unusual idea was put forward by BRUSCA & GILLIGAN (1983). They believed that isopods in the mouths of fish serve as "tongue replacements". According to this theory, a fish with an "isopod tongue" feeds more efficiently than a fish with no tongue at all.

THATCHER (1988) described *Asotana magnifica* from the mouths of piranhas of the Brazilian Amazon and made some observations on the habits and pathologenicity of these cymothoids. He reported one 34 mm isopod on the tongue of a host that was only 195 mm long (Fig. 10 - 11). The fish appeared to have been in good health and had a full stomach.

The surface of the tongue of the host was depressed in the exact shape of the ventral side of the isopod. This indentation in the floor of the mouth was attributed to pressure atrophy. As shown in figure 10 - 11, the head of these isopods is close to the entrance of the esophagus of the host. The anterior ends of isopods taken from such sites are frequently found to be covered with an amorphous and acellular substance. It seems logical to assume that this material represents regurgitated semi-digested food from the host stomach which is only a few millimeters from the isopod's head. We can conclude from this that the real food of the isopods is regurgitated host food (i.e. *vomitus*). The term obligate commensal would still apply in this case. Apparently, *Lironeca symmetrica* and some species of *Braga* also utilize the same feeding strategy.

In freshwater hosts of South America, there are three species of *Riggia* and two of *Artystone* all of which penetrate host tissue and are therefore much more pathogenic. The mouthparts of these forms are adapted for burrowing and mandibles and maxillae all have hook-like spines pointing outward (Fig. 10 - 16). Entrance holes are made either at the site of a missing pectoral fin (which the isopod probably removes) or near the anus (Figs. 10 - 19 to 10 - 22 & 10 - 32). These entrance holes remain open and the pleotelson can be seen to protrude slightly. Presumably this position permits the isopod to breathe, an act that is effected by beating the pleopods in the water. The body of the isopod remains within the body cavity of the host, frequently in the vicinity of the liver. There may be pressure atrophy of this or other organs but there is no evident inflammatory reaction or encapsulation of the parasite on the part of the host. There is also no evidence of secondary invasions of the open entrance hole. Perhaps the isopods secrete some antibiotic substance that inhibits secondary invaders. Isopods in this site may be feeding on blood serum although direct evidence of this is lacking.

IV. Prevention and treatment

Isopods do not ordinarily become a problem to the alert aquarist. Since even young specimens are large enough to be seen, they can simply be removed. Some chemical dips, such as a 1 : 4000 formalin solution, will encourage the isopods to leave their hosts. If isopods become too numerous in outdoor ponds, the only recourse is to drain and disinfect them.

V. Collection and study methods

When isopods are seen in or on fish, they and their host should be fixed in 10 % formalin solution. After 24 hours, both may be transfered to 70 % alcohol. The mouthparts, legs, uropods, pleopods and pleotelson may be removed from isopods with dissecting needles and permanent slides can be made of them by using the phenol-balsam method described in Chapter 6.

VI. Identification and keys

Neotropical fish parasitic isopods have been little studied. The genera and species are not well defined and several of these taxa were based on single female specimens. Many new forms no doubt await future description. Some characters that are useful in distinguishing these animals are: size, shape, color, number of antennal segments and the form of the cephalon, pleopods, uropods and pleotelson.

South America contains a greater variety of freshwater Cymothoidae than any other region of the world. At least 23 species, representing 9 genera, occur here. For comparison, there are no freshwater cymothoids in either North America or Europe and only 4 species known from Africa. According to BRUSCA (1981), there are some 250 species of cymothoids in 42 genera world-wide and most of these are marine.

Isopoda from Neotropical freshwater fish

Key to families:

1a. Antennae elongate, with more than 10 segments, clearly divisible into peduncle and flagellum. Mandible and first maxilla both hook-like. Head of male provided with horn-like projections . . . . Excorallanidae . . . . *Excorallana* (Figs. 10 - 38 to 10 - 42).
1b. Antennae short and stout, with fewer than 10 segments, not distinctly divisible. Mandible and first maxilla not hook-like. Head of male without horns . . . . Cymothoidae.

Key to Amazonian genera of Cymothoidae:

1a. Legs 1 - 6 prehensile and ending in claw-like dactyls; legs of pair 7 ambulatory and ending in simple dactyls . . . . .
  Aa. Abdomen (pleon) visibly segmented and separate from pleotenson (Fig. 10 - 17) . . . . *Artystone.*
  Ab. Pleon and pleotelson fused into a single unit (Fig. 10 - 34) . . . . *Riggia.*
1b. All 7 pairs of legs prehensile and ending in claw-like dactyls . . . . .
  Aa. Anterior margin of pereonite 1 trisinuate. Posterolateral margins of pereonites 2 - 7 pointed and projecting. . . . . *Nerocila.*
  Ab. Anterior margin of pereonite not trisinuate. Posterolateral margins of pereonites 2 - 7 not pointed and projecting . . . . 2.
2a. Anterior margin of cephalon provided with 3 rounded bosses (Fig. 10 - 14) . . . . . *Asotana.*
2b. Anterior margin of cephalon otherwise . . . . 3.
3a. Pereonite 7 unusually short, nearly covered by pereonite 6 (Figs. 10 - 44 & 10 - 45) . . . . *Paracymothoa.*
3b. Pereonite 7 not unusually short . . . . 4.
4a. Abdomen (pleon) abruptly narrower than thorax (pereon) (Figs. 10 - 18 & 10 - 48). . . . . *Telotha.*
4b. Pleon not abruptly narrower than pereon . . . . .
  Aa. Pleotelson wider than long (Figs. 10 - 8 to 10 - 10) . . . . *Braga.*
  Ab. Pleotelson small, heart-shaped (Fig. 10 - 7) . . . . *Philostomella.*
  Ac. Pleotelson subquadrangular (Figs. 10 - 30 & 10 - 46) . . . . *Lironeca.*

VII. Checklist of Isopods from Neotropical freshwater fish

Cymothoidae SCHIÖDTE, 1866

Flabellifera. Body symmetrical or asymmetrical; eyes prominent, compound, sessile. Legs (pereopods): all 7 pairs prehensile, or anterior 6 prehensile and terminal pair ambulatory; prehensile legs terminating in stout claw-like dactyls. Pleopods not ciliated; pleotelson and uropods usually not ciliated. Antennae reduced to 4 - 10 segments, without clear distinction between peduncle and flagellum. Mouthparts: mandibles with palps; first maxillae spined at tip; second maxillae bilobed at tip; maxillipeds provided with 2-segmented palps which have hooks on terminal segment. Parasitic on skin, in mouth, branchial chamber or within self-made cavities in fish.

Artystone SCHIÖDTE, 1866

Cymothoidae. Body symmetrical; head (cephalon) considerably immersed in first thoracic segment (pereonite). First 6 pairs of legs provided with claw-like dactyls; terminal pair ambulatory, without claws. Abdomen (pleon) segmented. Parasitic in self-made pouches within the body cavities of fish.

A. trysibia SCHIÖDTE, 1866: from *Geophagus brasiliensis* & *Crenicichla lacustris*: Brazil. (Fig. 10 - 3).
Body – maximum sizes: 20 x 11 mm (male); 26 x 18 mm (female).

A. minima THATCHER & CARVALHO, 1988: *Nannostomus beckfordi*: Upper Rio Negro, Amazonas State, Brazil. (Figs. 10 - 16, 10 - 17 & 10 - 19 to 10 - 22).
Measurements in mm: body – 3.7 - 4.0 x 1.9 - 2.0 (males); 5.2 - 6.9 x 2.7 - 3.7 (females); cephalon – 0.53 - 0.68 x 0.98 - 1.0 (males) & 0.62 - 0.90 x 1.0 - 1.3 (females).; pleotelson – 0.65 - 0.75 x 1.1 - 1.2 (males) & 1.1 - 1.3 x 1.4 - 1.8 (females).

Asotana SCHIÖDTE & MEINERT, 1881

Cymothoidae. Female: body large, convex dorsally, cream to straw-colored with sparse black pigment spots. Cephalon large, subrectangular, not deeply immersed in pereonite 1, keeled dorsally and with two pairs of dorsolateral tubercles; frontal margin curved downward and terminating in three rounded bosses. Mandibles with dorsal and ventral flaps; maxillae without spines. Pereonite 1 with brown or black roughened patches of denticles dorsally. Pereopods short, slender, subequal in length; first 6 pairs of dactyls larger than 7th. Abdomen inserted at its base. Uropods short and wide. Pleotelson tongue or shield-shaped. Parasites or commensals in the buccal cavities of freshwater fish.

Asotana formosa SCHIÖDTE & MEINERT, 1881: host unknown: Peru (probably Amazonia). (Fig. 10 - 50).
Body – 30 x 12 mm (female; male unknown). Body tapers gradually anteriorly and posteriorly from pereonite 5.

Asotana magnifica THATCHER, 1988: *Serrasalmus* sp.: Roraima Territory, Brazil. (Figs. 10 - 11 to 10 - 15).
Body with abdomen abruptly narrower than thorax, measures – 30 - 40 x 14 - 15 mm.

Asotana splendida (LEIGH-SHARPE, 1937): host unknown: Ecuador. (Figs. 10 - 6 A-B).
Female: body tapers abruptly anteriorly and posteriorly from pereonites 3 & 4; measures 21 x 11 mm (male unknown).

Braga SCHIÖDTE & MEINERT, 1881

Cymothoidae. Body symmetrical; cephalon little immersed in pereonite 1. All 7 pairs of pereopods prehensile and provided with stout claw-like dactyls. Pleotelson usually wider than long. Parasites, or commensals, found on the tongue or in the gills of freshwater fish.

B. cichlae SCHIÖDTE & MEINERT, 1881: *Cynopotamus humeralis, Cichla ocellaris* & *C. temensis*: Brazil (São Paulo, Minas Gerais, Pará & Amazonas States). (Fig. 10 - 28).
Body about twice as long as wide: female – 25 mm maximum length; male – 15 mm.

B. fluviatilis RICHARDSON, 1911: unidentified catfish: Argentina, Surinam & Brazil (Figs. 10 - 10 A-B).
Female: body 22 x 14 mm; dactyl of pereopod 1 longer than the others.

B. nasuta SCHIÖDTE & MEINERT, 1881: *Hypostomus* sp.: Brazil (São Paulo, Bahia & Amazonas States). (Figs. 10 - 27 & 10 - 37).
Female: body – 20 - 25 mm long; male – about 11 mm long.

B. patagonica SCHIÖDTE & MEINERT, 1884: *Salminus hilarii* & *Hoplias malabaricus*: Argentina, Paraguay, Surinam & Brazil (São Paulo, Pernambuco, Bahia, Pará & Amazonas States). (Figs. 10 - 8 A-C, 10 - 9 A-C & 10 - 23 to 10 - 26).
Female to 26 mm. Male to 15 mm.

Lironeca LEACH, 1818

This genus can not be defined at present. The marine and freshwater forms now assigned to this taxon do not appear to have many characters in common and they may represent more than one genus.

L. guianensis VAN NAME, 1925: from gills of *Leporinus fasciatus, Pimelodus clarias* & *Brachyplatystoma* sp.: Guyana. (Fig. 10 - 46).

This species is elongate with a thorax that tapers gradually from pereonite 4 to the abdomen. The cephalon has a sharp point anteriorly (as seen from above) and the pleotelson is subquadrangular.

Female – 17.7 - 26 mm long. Male – unknown.

L. orinoco BOWMAN & DÍAZ-UNGRÍA, 1957: gills of Cichlidae: Orinoco River, Venezuela. (Fig. 10 - 47).

In this species, the head is not much immersed in the pereon but the abdomen is. The anterior margin of the cephalon is rounded. The pleotelson is also rounded posteriorly and is slightly wider than long.

Female – 13.9 x 7.0 mm. Male – 8.5 x 4.5 mm.

L. symmetrica VAN NAME, 1925: on tongue or in gills of *Serrasalmus rubripennis, S. rhombeus, Cichla ocellaris, Brachyplatystoma* sp., *Vendelia cirrhosa, Carnegiella strigata*: Guyana, Venezuela, French Guiana & Brazil (Pará & Amazonas States). (Figs. 10 - 29 to 10 - 31).

This species has longer legs than species of *Braga* and the pleotelson is inflated anteriorly and medially.

Female – 17 - 20.6 mm long. Male – not described.

Nerocila LEACH, 1818

Cymothoidae. Body elongate, considerably flattened. Anterior margin of pereonite 1 trisinuate. Postero-lateral margins of pereonites 2 - 7 pointed and projecting. Epimeres of pereonites 2 - 7 also pointed and projecting posteriorly. Parasites of skin and fins of marine and freshwater fish.

N. armata DANA, 1853: skin of *Leporinus fasciatus, Crenicichla saxatilis, Cichla ocellaris, Pseudauchenipterus nodosus*: Uruguay, Guyana & Brazil (São Paulo & Rio de Janeiro States).

Female – body 18 - 24 mm long. Male – 7.5 - 18 mm long.

Paracymothoa LEMOS DE CASTRO, 1955, (emend. BOWMAN, 1986)

Cymothoidae. Body oval. Head not deeply immersed in pereonite 1; anterior margin broad and almost straight, or convex, not curved ventrally. Antennae short, antennae 1 widely separated at base. Pereonite 1 with short antero-lateral angles. Pereonite 7 shorter than others. Pleon deeply immersed in pereon and narrower than latter. Legs short; 1 - 3 smaller than 4 - 6. Dactyl of leg 7 smaller than others. From the mouths of freshwater fish.

P. astyanactis LEMOS DE CASTRO, 1955: *Astyanax bimaculatus*: Brazil (Rio de Janeiro & Minas Gerais States). (Fig. 10 - 45).

Female – 10.5 x 5 mm. Rami of uropods subequal, reach posterior margin of pleotelson.

P. parva TABERNER, 1976: mouth of *Hyphessobrycon callistus*: Argentina.

Female – 4.2 x 2 mm. Rami of uropods subequal, reach posterior margin of pleotelson.

P. tholoceps BOWMAN, 1986: mouth of *Hoplias macrophthalmus*: Venezuela (Amazonas State). (Fig. 10 - 44).

Female – 24.3 x 12.2. Outer ramus of uropod longer, reaches to near equatorial region of pleotelson.

Philostomella SZIDAT & SCHUBART, 1960

Cymothoidae. Body symmetrical; head not immersed. All legs prehensile and clawed. First antennae: 8-segmented in female; 7-segmented in male. Second antennae: 8-segmented in female; 9-segmented in male. Pleotelson about as wide as long, keeled. Mouth parasites of fish.

P. cigarra SZIDAT & SCHUBART, 1960: *Cynopotamus humeralis*: Brazil (São Paulo State). (Figs. 10 - 7 A-C & 10 - 49).

Body – 29 mm long (female); 15 mm long (male).

Riggia SZIDAT, 1948

Cymothoidae. Body symmetrical or asymmetrical; head immersed in first pereonite. Pereopods 7 without claws. Pleon and pleotelson fused together to form a single unit. Parasites found within self-made pouches in the body cavities of fish.

R. paranensis SZIDAT, 1948: *Curimata platana*: Brazil (Parana River, Parana State). (Fig. 10 - 51).

Body – 22 x 16 mm (female).

R. brasiliensis SZIDAT & SCHUBART, 1959: *Leporinus copelandi, L. octofasciatus, Schizodon nasutus* & *Leporellus vitattus*: Brazil (São Paulo State). (Figs. 10 - 5 A-B).

R. nana SZIDAT & SCHUBART, 1959: *Leporinus striatus*: Brazil (São Paulo State). (Figs. 10 - 1 A-C).

Body – 14 x 10 mm (female).

Telotha SCHIÖDTE & MEINERT, 1884

Cymothoidae. Body symmetrical; cephalon triangular, not immersed in pereonite 1, anterior margin curved sharply downward. All legs prehensile and clawed. Antennules 8-segmented; antennae 9-segmented; antennae well separated at bases. Pleotelson wider than long. Parasites of gill cavities of freshwater fish.

T. henselii (VON MARTENS, 1869): *Hoplias malabaricus, Pimelodus clarias, Geophagus* sp. & *Brachyplatystoma* sp.: Guyana, Surinam, Uruguay, Argentina & Brazil (Rio Grande do Sul). (Figs. 10 - 2 A-B).

Body – 16 - 26 mm long (female); male unknown.

T. lunaris SCHIÖDTE & MEINERT, 1884: *Stenarchus brasiliensis*: Brazil. (Fig. 10 - 48).

Body – 28 mm long (female); male unknown.

T. silurii SZIDAT & SCHUBART, 1959: *Iheringichthys labrosus*: Brazil (São Paulo State). (Figs. 10 - 4 A-B).

Body – 13 mm long (female); male unknown.

Excorallanidae STEBBING, 1904

Flabellifera. Body symmetrical, with nearly parallel sides. Epimera present on all pereonites but the first. Anterior 3 pairs of pereopods prehensile, posterior 4 pairs ambulatory. Cephalon little immersed, with conspicuous horn-like processes in male (which are lacking or smaller in female); eyes prominent. Antennae long, with 2 - 4 segments in peduncle and 10 - 30 in flagellum. Mouthparts: mandible with large curved apical tooth; mandibular palp 3-segmented, with terminal segment expanded; first maxilla robust; second maxilla short; maxilliped narrow, free. Uropods long; pleotelson reduced, subtriangular. Freeliving or ectoparasitic on fish.

Excorallana STEBBING, 1904

Excorallanidae, with the characters of the family.

E. berbicensis BOONE, 1918: skin of *Lycengraulis grossidens*: Guyana.

Body – 7.8 mm (female); 6 mm (male).

Excorallana sp.: from skin of *Ageneiosus brevifilis*: Brazil (Pará & Amazonas States). (Figs. 10 - 38 to 10 - 42).

Body – 5 - 8 x 2 - 3 mm (both sexes).

Additional species of parasitic Amazonian isopods are known to exist but have not yet been described. Two of these are listed as *Riggia* sp. and shown in Figs. 10 - 32 to 10 - 36.

VIII. Plates of Isopoda (Figs. 10 - 1 to 10 - 51)

(Explanation of figures)

10 - 1. *Riggia nana* (female): A. head end; B. pleotelson; C. uropod (all after SZIDAT & SCHUBART 1959). 10 - 2. *Telotha henselii* (female): A. head end; B. pleotelson and uropods (all after RINGUELET 1942). 10 - 3. *Artystone trysibia*: A. head end of male; B. uropod of female (both after SZIDAT & SCHUBART 1959). 10 - 4. *Telotha silurii* (female): A. head end; B. pleotelson; C. uropod (all after SZIDAT & SCHUBART 1959). 10 - 5. *Riggia brasiliensis* (female): A. head end; B. pleotelson (both after SZIDAT & SCHUBART 1959).

10 - 6. *Asotana splendida* (female): A. head end; B. pleotelson (both after LEIGH-SHARPE 1937). 10 - 7. *Philostomella cigarra* (female): A. head end; B. pleotelson; C. uropod (all after SZIDAT & SCHUBART 1959).

10 - 8. *Braga patagonica*: A. head end of female; B. uropod of male; C. pleotelson of female (all after MONOD 1931). 10 - 9. *Braga patagonica* (female): A. head end; B. uropod; C. pleotelson (all after SZIDAT & SCHUBART 1959). 10 - 10. *Braga fluviatilis* (female): A. head end; B. pleotelson (both after GIAMBIAGI DE CALABRESE 1933).

10 - 11 to 10 - 13. *Asotana magnifica* (female): 10 - 11. on tongue of *Serrasalmus* sp. (operculum removed); 10 - 12. dorsal view; 10 - 13. lateral view.

10 - 14. *Asotana magnifica*: cephalon (frontal view). 10 - 15. *Asotana magnifica*: cephalon (dorsal view).

10 - 16. *Artystone minima* (female): mouthparts. 10 - 17. *Artystone minima* (female): (dorsal view). 10 - 18. *Telotha* sp. (dorsal view).

10 - 19 to 10 - 22. *Artystone minima* in *Nannostomus beckfordi*: 10 - 19 & 10 - 20. open entrance hole with visible pleotelson where pectoral fin is missing; 10 - 21. open rear entrance hole near anus of host; 10 - 22. body wall removed to show parasite "in situ".

10 - 23 to 10 - 25. *Braga patagonica* (female): 10 - 23. dorsal view; 10 - 24. ventral view; 10 - 25. lateral view.

10 - 26. *Braga patagonica* in piranha (*Serrasalmus* sp.) branchial chamber (operculum removed). 10 - 27. *Braga nasuta*: female (dorsal view). 10 - 28. *Braga cichlae*: female (dorsal view).

10 - 29 to 10 - 31. *Lironeca symmetrica* (female): 10 - 29. on tongue of *Serrasalmus* sp.; 10 - 30. dorsal view; 10 - 31. ventral view.

10 - 32 to 10 - 35. *Riggia* sp. in *Curimata* sp.: 10 - 32. entrance hole in place of pectoral fin; 10 - 33. same fish from other side (body wall removed to show parasite "in situ"; 10 - 34. dorsal view of parasite; 10 - 35. ventral view of parasite.

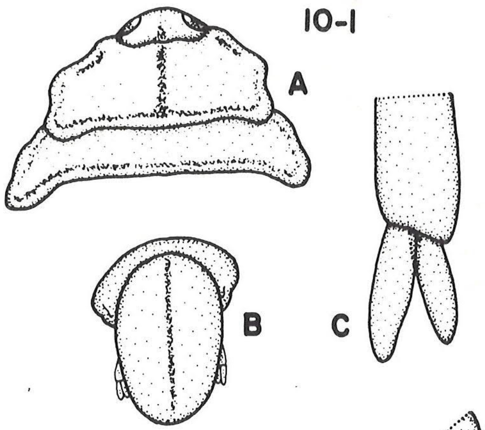
10 - 36. *Riggia* sp. (dorsal view). 10 - 37. *Braga nasuta*: female (dorsal view). 10 - 38. *Excorallana* sp.: male (lateral view). 10 - 39. *Excorallana* sp.: male (ventral view).

10 - 40. *Excorallana* sp. (female): mandibular palp. 10 - 41. *Excorallana* sp. (female): mouthparts (ventral view). 10 - 42. *Excorallana* sp. (female): pereopod. 10 - 43. Pentastomida, *Sebekia* sp.: cephalic hook.

10 - 44. *Paracymothoa tholoceps* (female): after BOWMAN 1986. 10 - 45. *Paracymothoa astyanactis* (female): after LEMOS DE CASTRO 1955. 10 - 46. *Lironeca guianensis* (female): after VAN NAME 1925. 10 - 47. *Lironeca orinoco* (female): after BOWMAN & DÍAZ-UNGRÍA 1957.

10 - 48. *Telotha lunaris* (female): after SCHIÖDTE & MEINERT 1884. 10 - 49. *Philostomella cigarra* (female): after SZIDAT & SCHUBART 1960. 10 - 50. *Asotana formosa* (female): after SCHIÖDTE & MEINERT 1881. 10 - 51. *Riggia paranensis* (female): after SZIDAT 1948.

10-1



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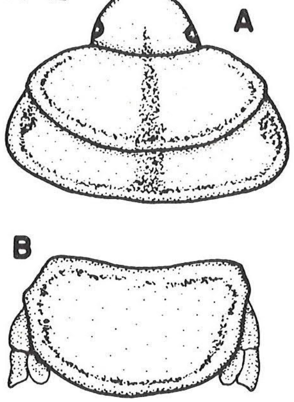

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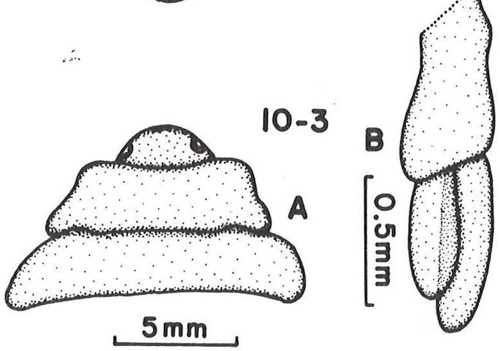

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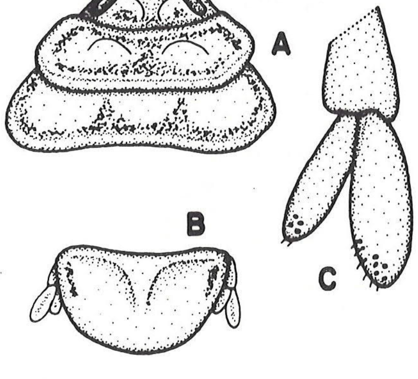

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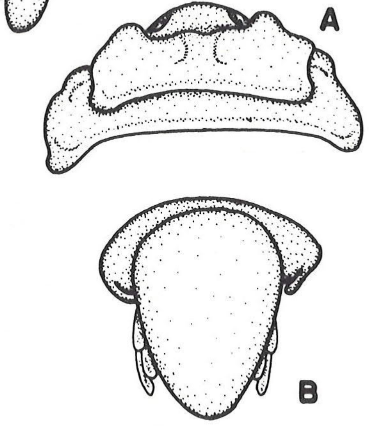

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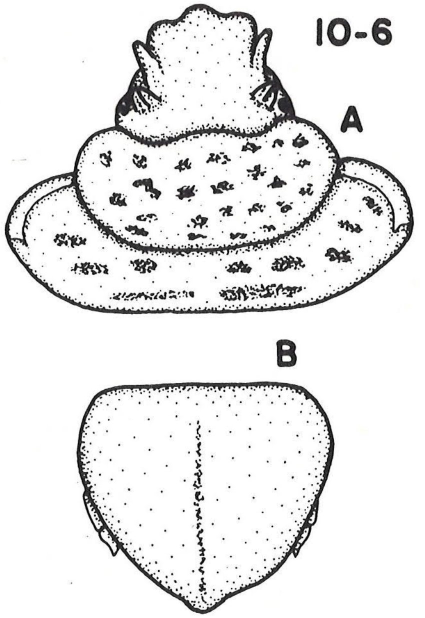

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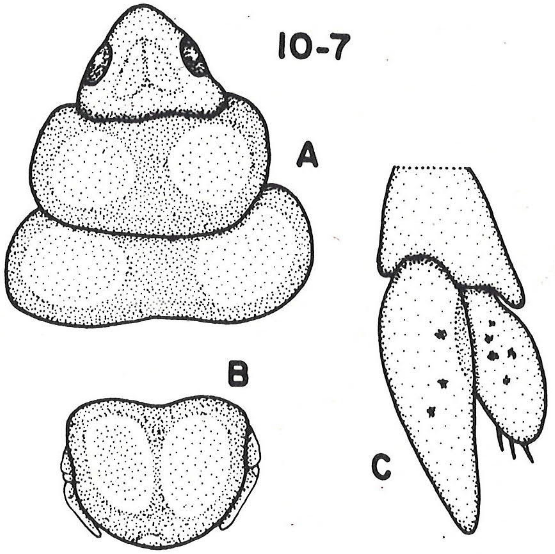

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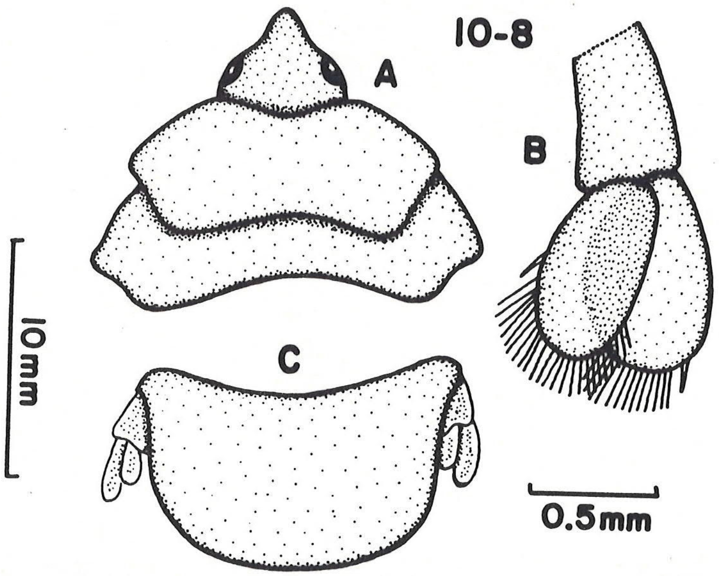

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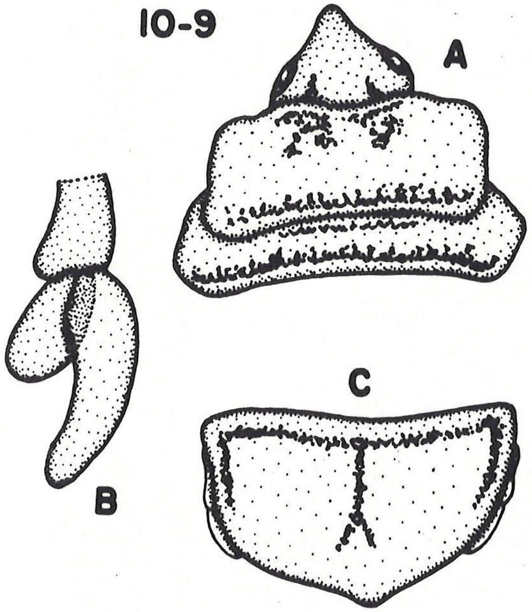

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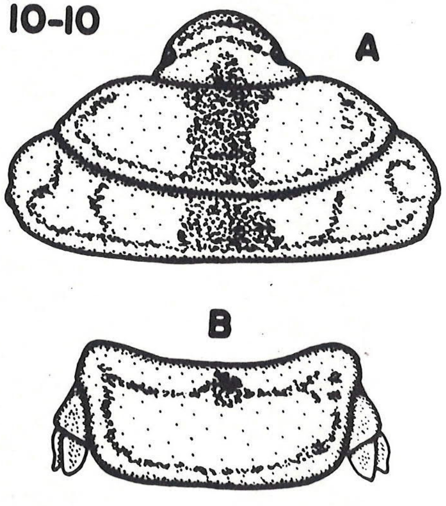

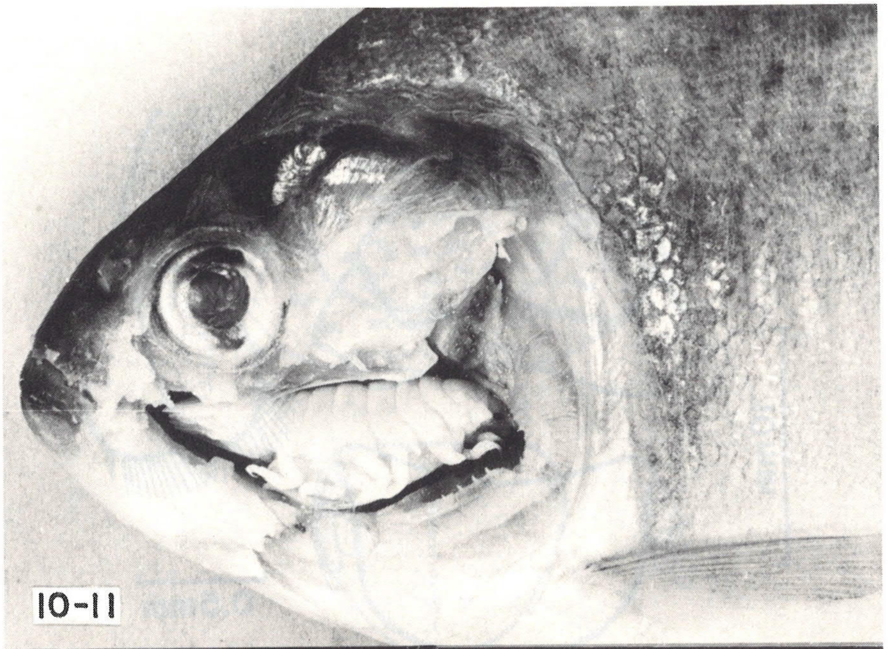

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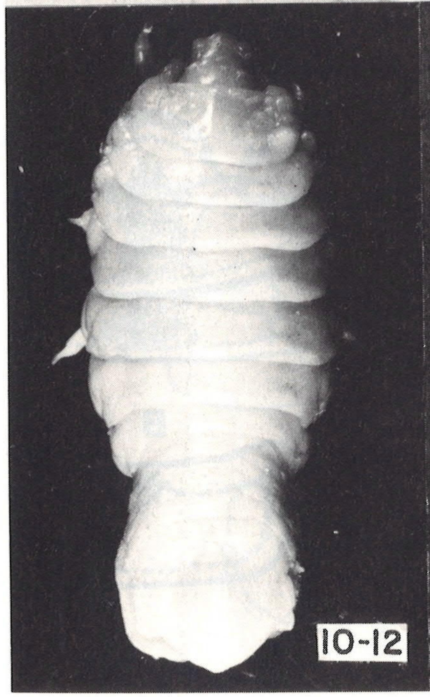

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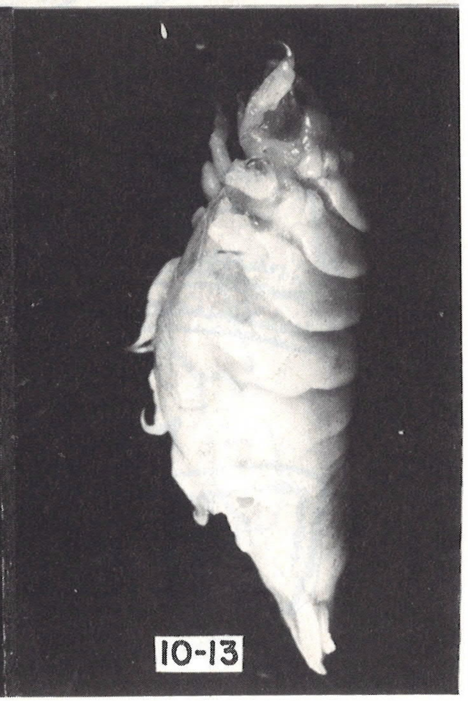

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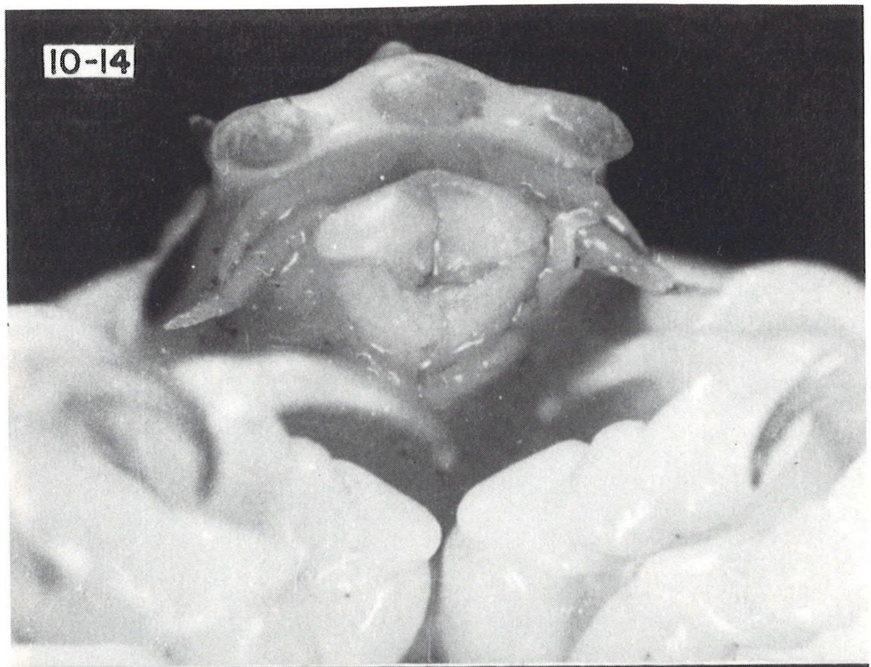

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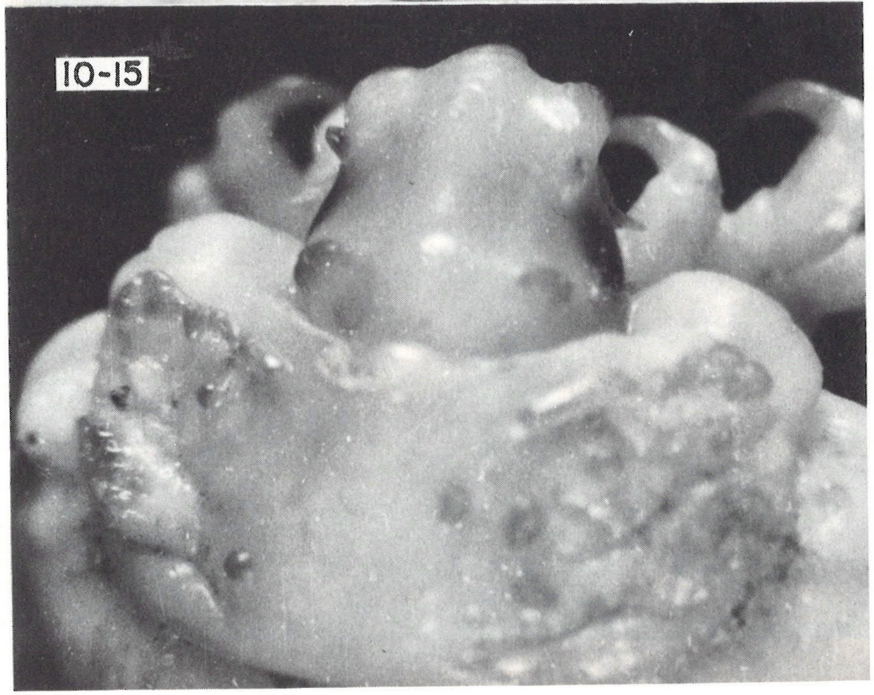

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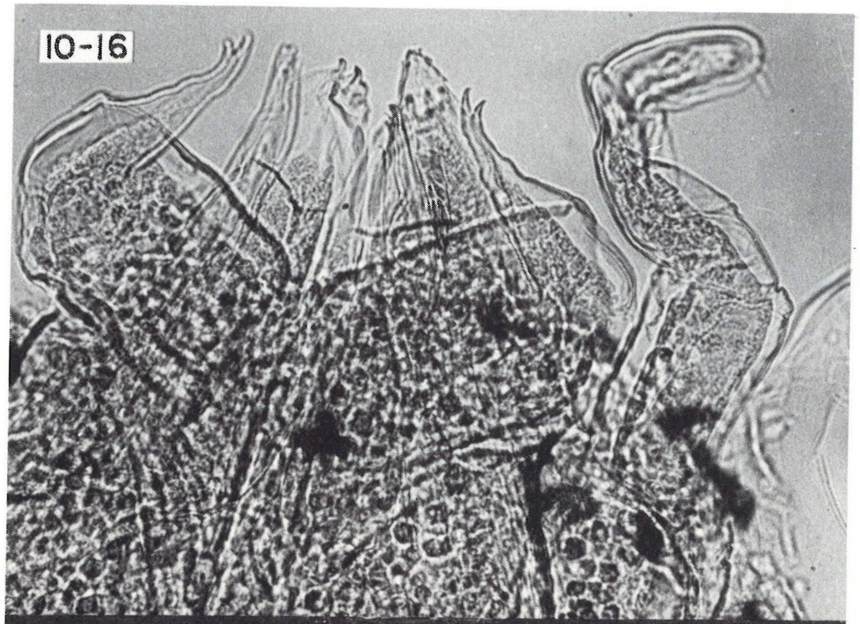

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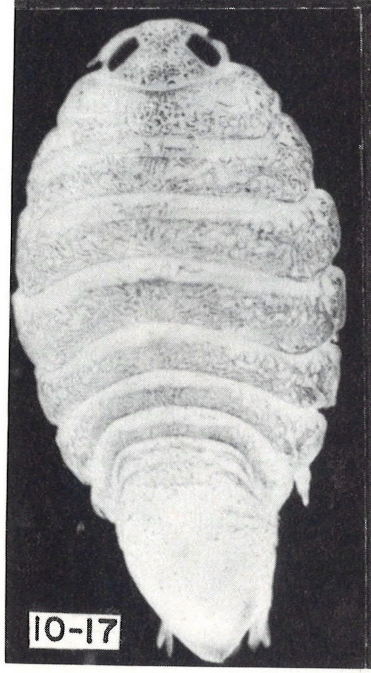

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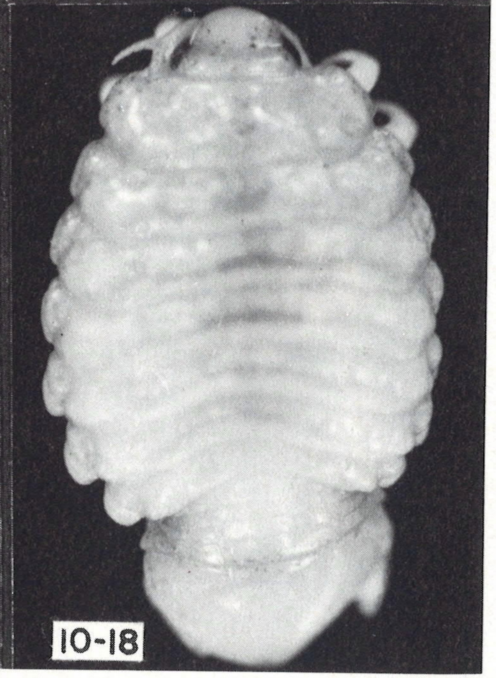

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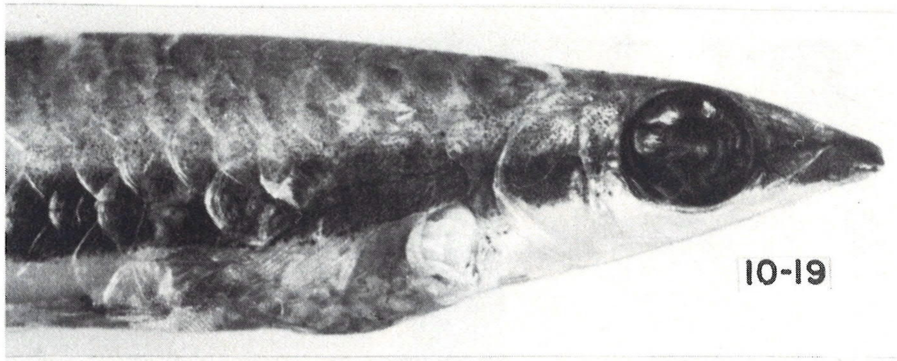

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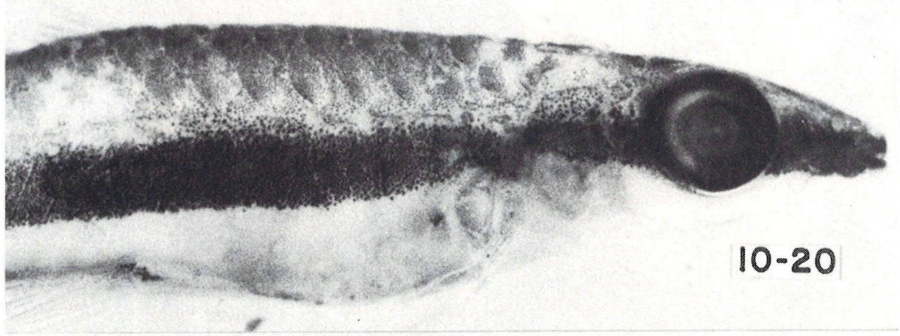

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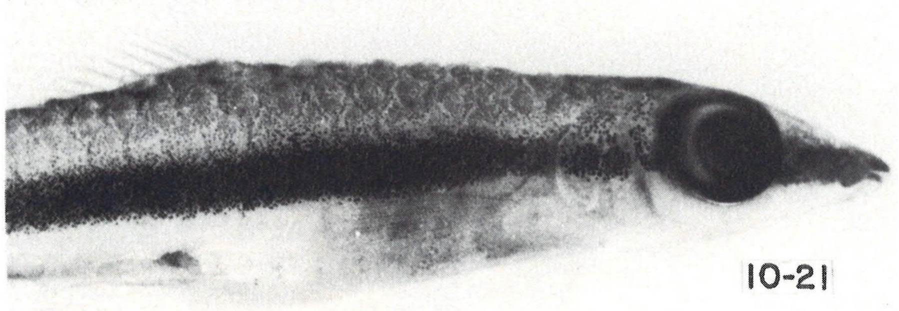

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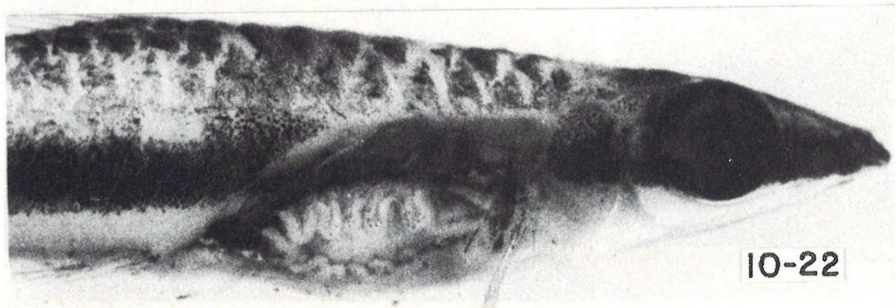

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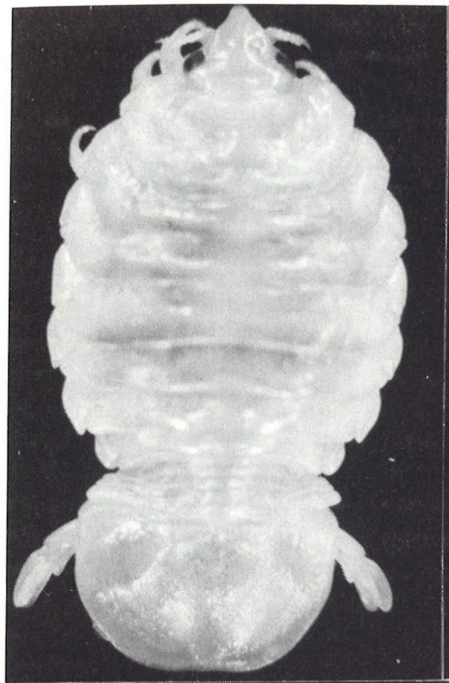

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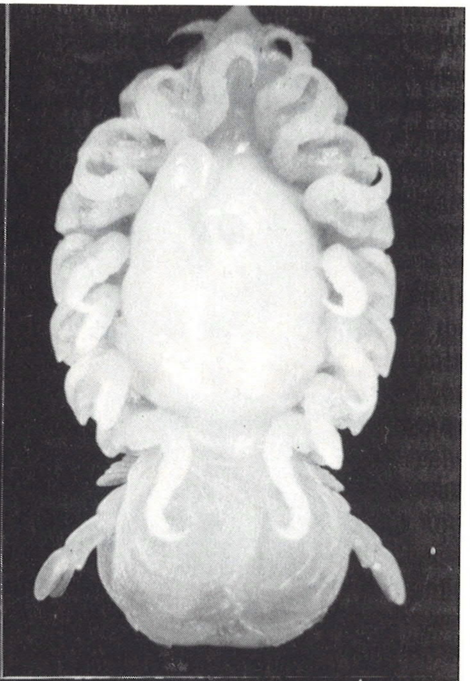

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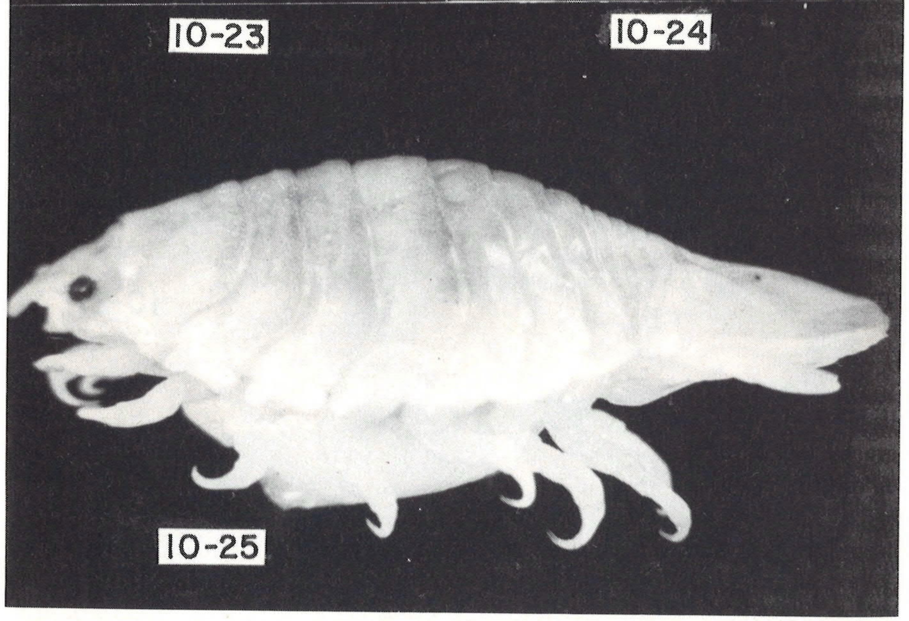

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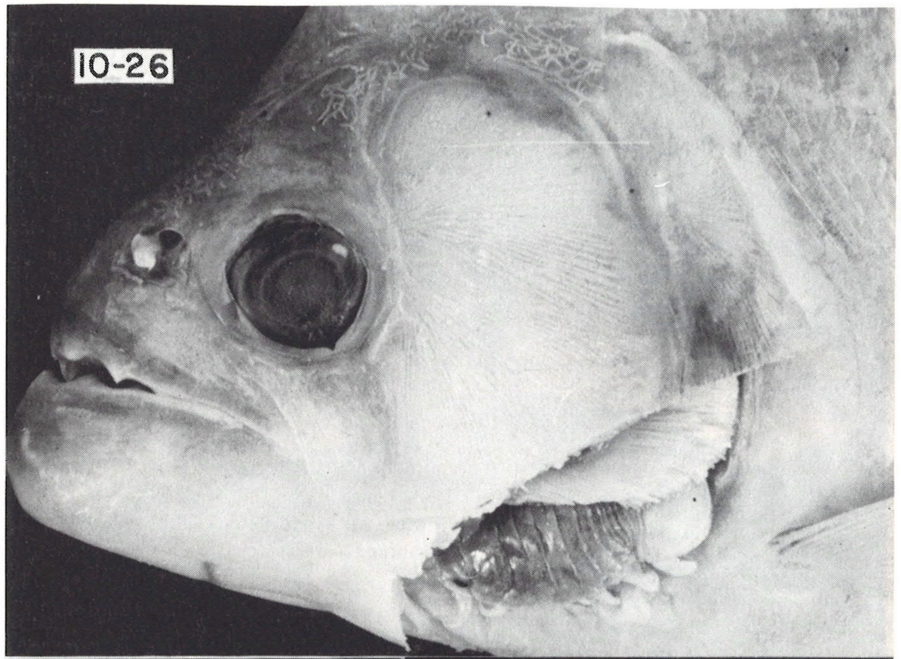

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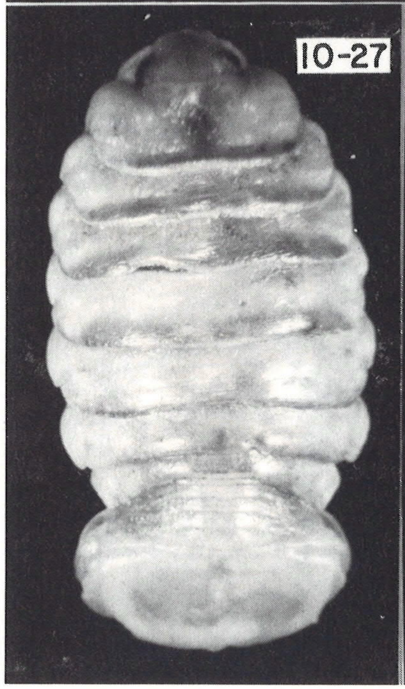

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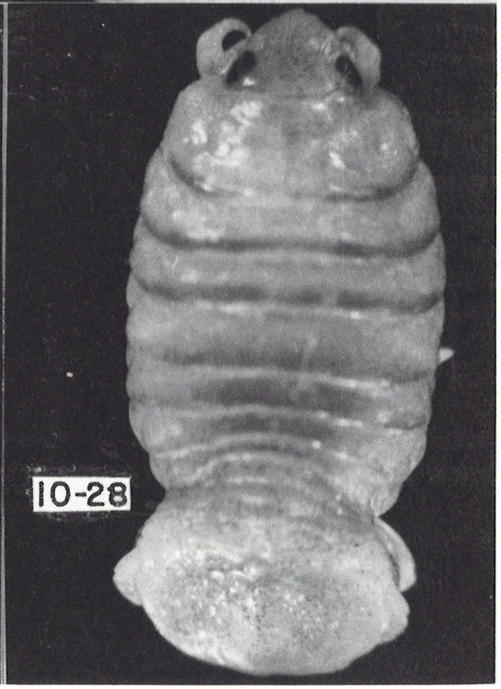

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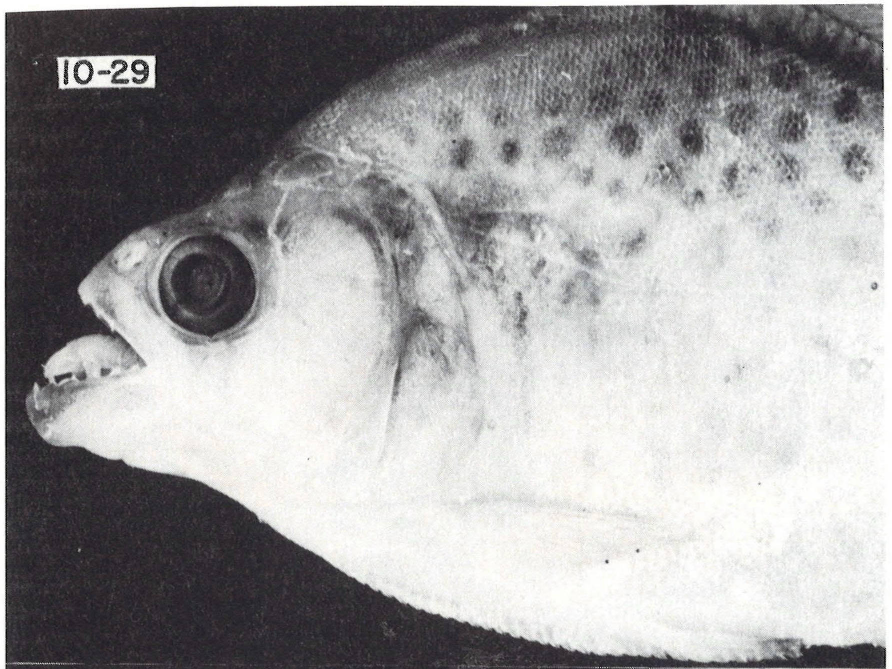
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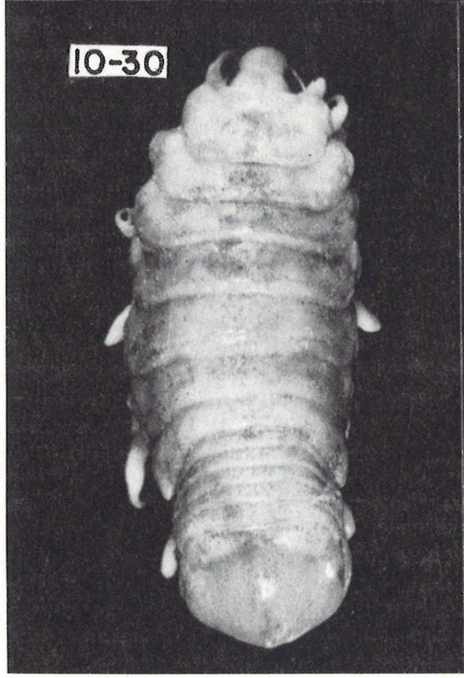
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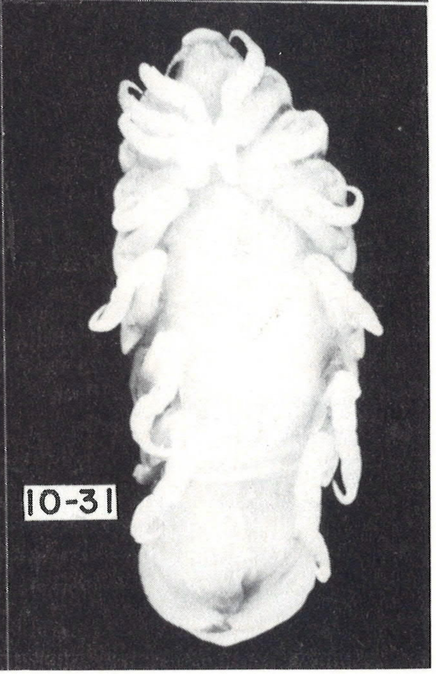
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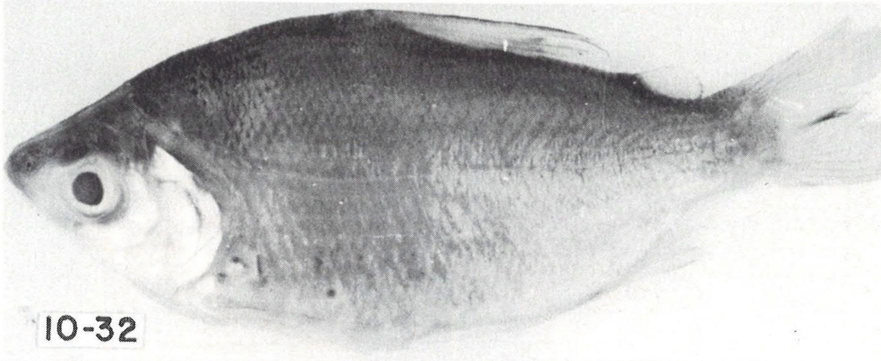
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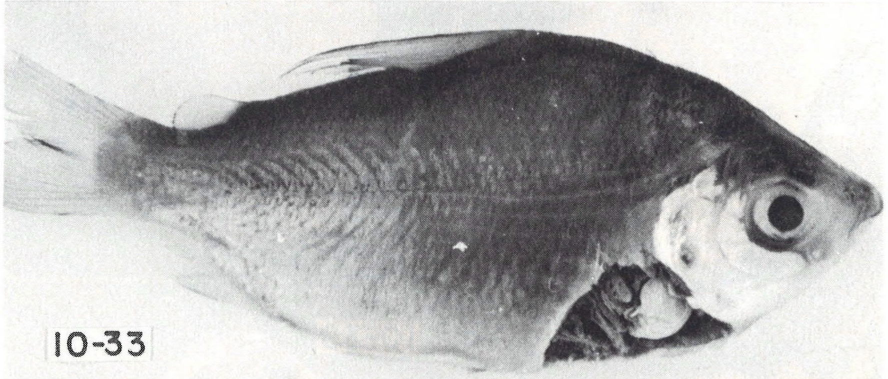
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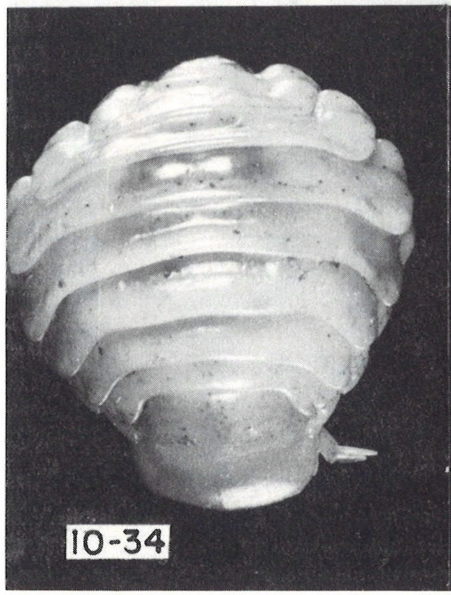
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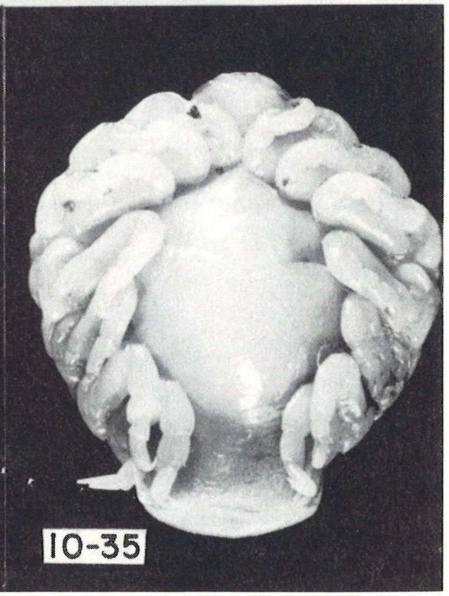
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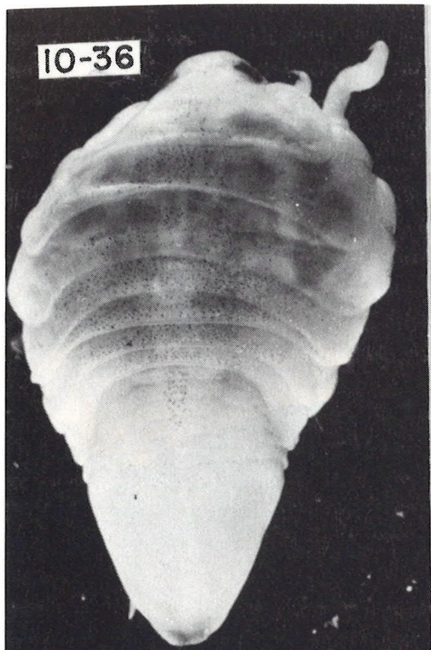
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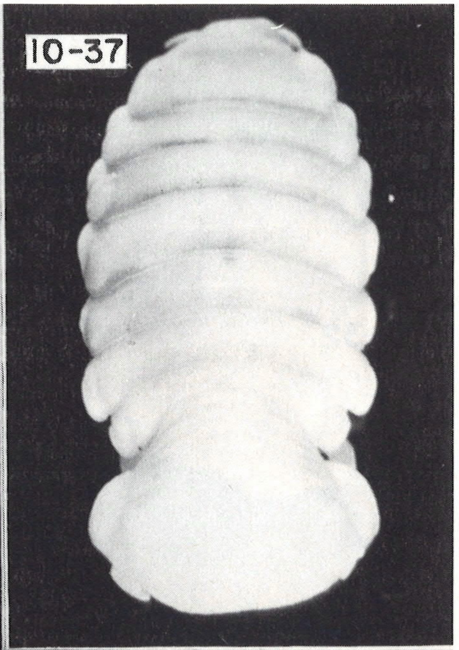
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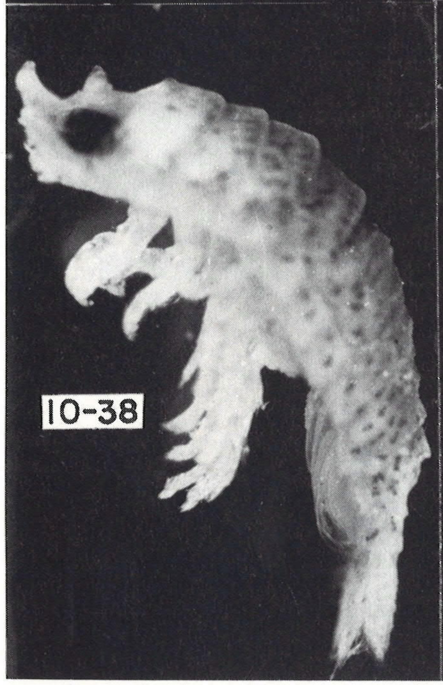
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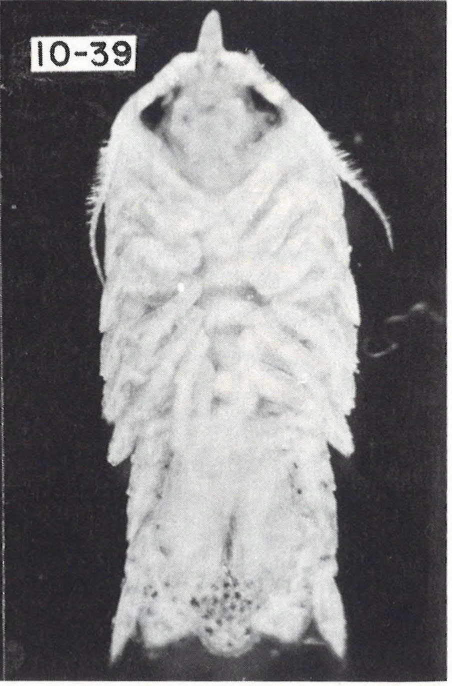
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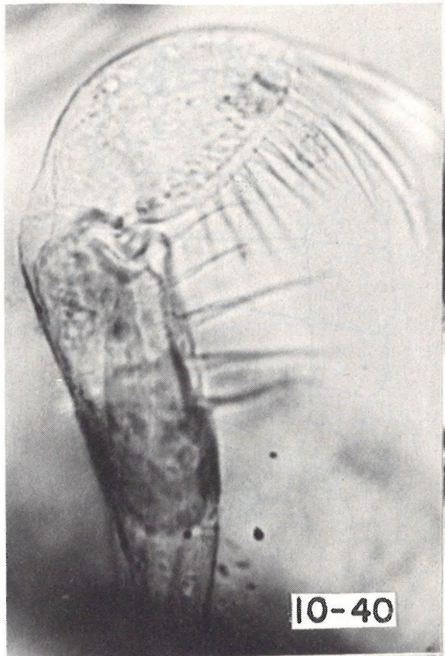
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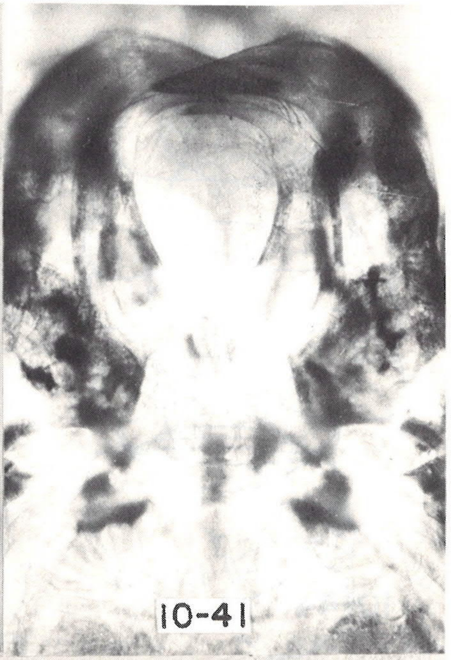
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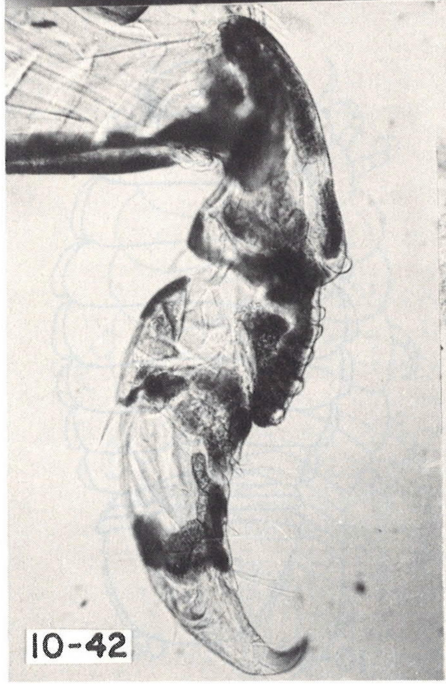
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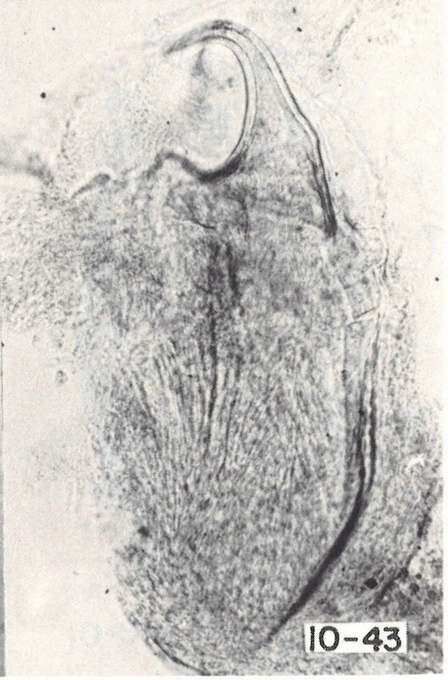
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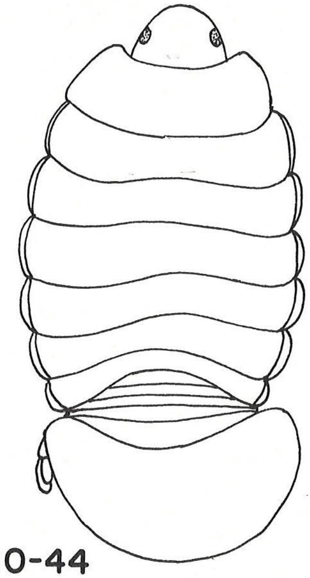

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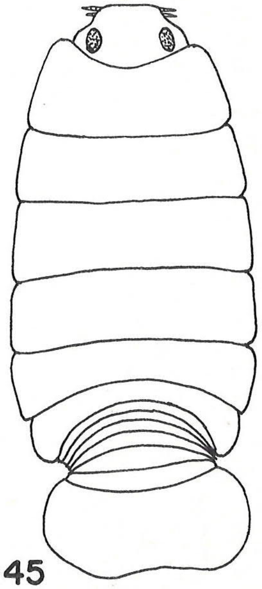

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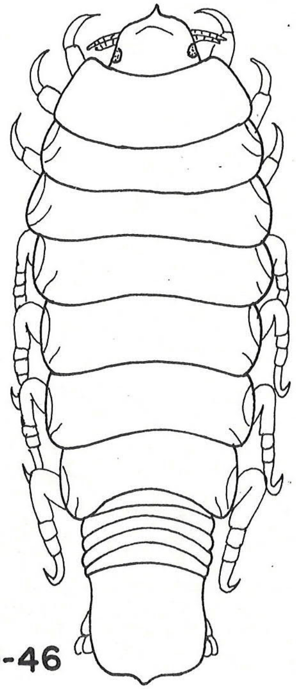

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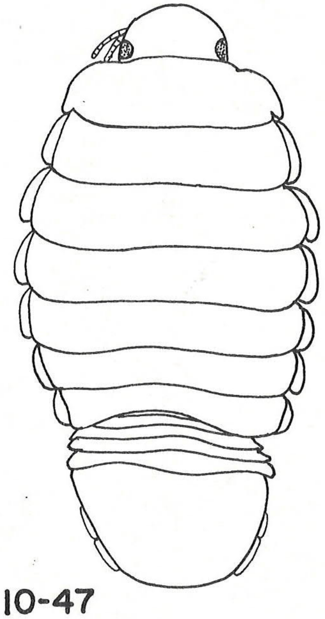

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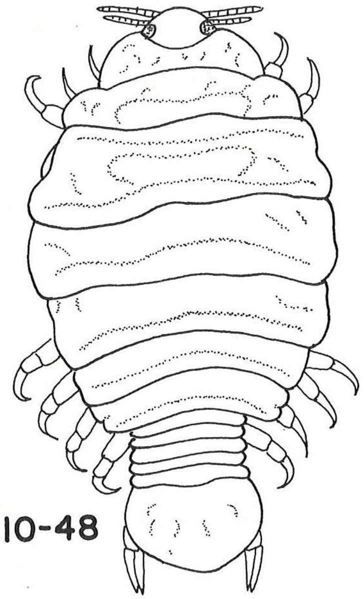

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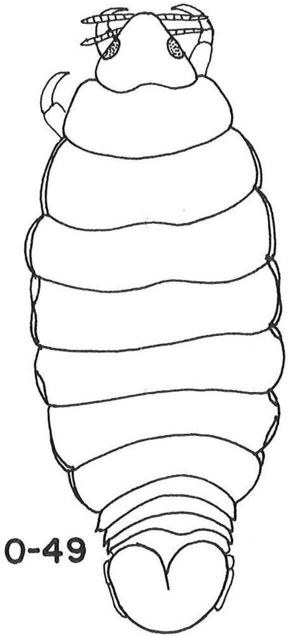

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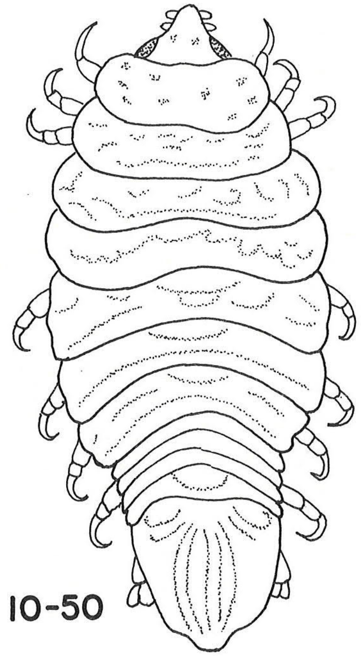

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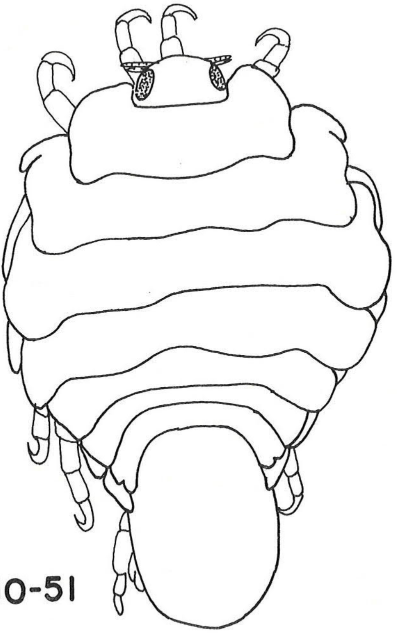

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11. Hirudinea, Pentastomida and miscellaneous pathological conditions

Hirudinea

I. Definition and morphology

The Hirudinea, or leeches, comprise a highly specialized class of the phylum Annelida. Most occur in freshwater but many are also found in the sea and some are terrestrial in the humid tropics. They are thought to have arisen from the class Oligochaeta, to which the earthworm belongs. Leeches have segmented bodies, as do the other members of the phylum, but unlike the earthworm, the segments are not defined by internal septa. Leeches can generally be recognized by the anterior and posterior suckers that they possess. Those that attack fish do so as temporary ectoparasites seeking a blood meal.

The bodies of leeches are frequently spindle-shaped being narrower anteriorly than posteriorly. In cross-section they are either circular or oval. In size, they range from 5 mm to about 45 cm. Surface features include pigmentation (red, brown, green and yellow in spots bands or longitudinal lines), one or more pairs of eyes, annuli and sometimes dorsal papillae.

The digestive system of leeches consists of an anterior mouth, followed by a muscular pharynx, an esophagus and an intestine. The mouth is either provided with teeth or it has a protrusible proboscis. The intestine shows segmentation in that there are paired lateral ceca. The intestine opens through the anus which is located dorsally over the posterior sucker.

All leeches are hermaphroditic. The male reproductive system consists of paired testes (or testisacs) five to ten in number or they may be more numerous. On each side there are vasa efferentia joining the testes to the vas deferens which, in turn, leads into the atrium. The atrium is a three-chambered structure with lateral horns. The female system is comprised of paired ovaries (or ovisacs) terminating in ducts which join to form a vagina. In most species, the male and female genital pores are separate and located on the 11th and 12th body segments, respectively.

II. Life-cycle and transmission

Most leeches are predatory and feed on small invertebrates, but a few species attack fish and other vertebrates. Predatory leeches swim actively but those that parasitize fish usually hide on aquatic vegetation and wait until a fish passes near.

Reproduction in leeches is similar to that of earthworms in that there is copulation and a mutual exchange of sperm bundles (spermatophores). In some species there is a penis for depositing sperm in or near the vagina, but in others, spermatophores are simply implanted on the surface. In such species, the sperm penetrate the body wall by local histolysis and make their way to the ovisacs where they fertilize the ova. The fertilized ova (eggs) are released through the female genital pore and are there encapsulated by secretions from a band of glandular cells (clitellum). Several eggs are usually placed in each capsule (cocoon) and these are normally fastened to a substrate or buried in the mud.

In Glossiphoniidae, however, true cocoons are not formed, but the fertilized eggs are carried on the ventral surface of the body in membranous capsules. After the eggs hatch, the young leeches remain attached to the parent for some time.

III. Pathology

Other than localized hemorrhaging at the feeding sites, little specific pathology has been associated with Neotropical leeches. In heavy infestations, leeches can produce anemia and death from blood loss. Furthermore, after feeding they drop from the host leaving small wounds that may facilitate secondary invasions by bacteria and viruses. Leeches also serve as intermediate hosts for *Trypanosoma* and *Cryptobia*, which are flagellate protozoan parasites of the circulatory system.

IV. Prevention and treatment

Leeches are most often introduced into aquaria on aquatic vegetation. Plants collected in nature should be maintained in aquaria for several weeks before being placed with fish. Leeches are relatively sensitive to chemicals in the water, so most of the common dip treatments will cause them to leave the fish. One of the easiest and cheapest is the 1 : 4000 formalin solution treatment described in Chapter 3. Contaminated ponds should be drained and treated with quick lime.

V. Collection and study methods

Living leeches should be killed by placing them in 15 % alcohol for 15 minutes. They can then be fixed by arranging them between glass microscope slides in a petri dish and pouring AFA over them. Permanent whole-mount slides can be made by the method described for trematodes in Chapter 4.

VI. Identification and key

Some important characters used in identifying leeches are: body shape, size and color; number and position of eyes; and position of genital pores. So far, only three genera and four species of Hirudinea have been reported from Neotropical freshwater fish.

Key to leeches from Neotropical freshwater fish

I. Body dorso-ventrally flattened; tapering towards anterior extremity. One, 2, 3 or 4 pairs of eyes present on head end; eyespots lacking on posterior sucker and on body. Three annuli present for each body segment. Oral sucker small, continuous with neck . . . . Glossiphoniidae (Figs. 11 - 5 to 11 - 8).
  A. One pair of eyes present . . . . *Placobdella.*
  B. Two to four pairs of eyes present . . . . *Theromyzon.*
II. Body cylindrical, slender. None, 1 or 2 pairs of eyes present on head end; eyespots may be present on posterior sucker or lateral margins of body. Seven or more annuli present for each body segment. Oral sucker expanded, distinct from neck . . . . Piscicolidae . . . . *Myzobdella.*

VII. Checklist of Hirudinea from Neotropical fishes

Glossiphoniidae

Body flattened, wider posteriorly and tapering anteriorly. Oral sucker fused with body; mouth a small pore in oral sucker through which a muscular proboscis can be protruded; jaws and teeth absent. One to 4 pairs of eyes present; eyespots absent on body and posterior sucker. Three annuli present per segment, in midbody; clitellum not distinct. Eggs in membranous sacs on ventral surface of adult; young cling to ventral surface of adult for some time. Free-living and parasitic on invertebrates and vertebrates.

Placobdella BLANCHARD, 1893

Glossiphoniidae. Body heavily pigmented, usually greenish or brownish with spots, stripes or blotches of yellow or orange; dorsum frequently papillate; size 10 - 65 mm. Anterior end with or without expanded head-like structure. One pair of eyes present; accessory eyes rarely present. Free-living or parasitic on fish or turtles.

P. molesta CORDERO, 1934: turtles and fishes: Uruguay.

Description unavailable.

P. parasitica (SAY, 1924): turtles and fishes: United States & Mexico.

Body – 38 - 65 mm long. Coloration variable, dorsum usually provided with median, longitudinal stripe; ventral surface with 8 - 12 bluish, greenish or brownish longitudinal stripes.

Theromyzon PHILLIPPI, 1867

Glossiphoniidae. Body gelatinous, not heavily pigmented, pale amber or green in color; spots or lines sometimes present; shape variable. Four pairs of eyes present. Gonopores separated by 2 - 4 annuli. Free-living or parasitic on fish or in nasal fossae or eyes of aquatic birds.

T. propinquum RINGUELET, 1947: *Percichthys trucha*: Argentina. (Figs. 11 - 9 A-C).

Body smooth, except for small sensilla; 14 - 15.5 mm long. Three annuli present between male and female gonopores.

Piscicolidae JOHNSTON, 1865

Body cylindrical, narrow; sometimes divided into narrow neck (trachelosome) and thicker posterior region (urosome); with or without lateral projections (pulsatile vesicles) on urosome. Oral sucker usually distinct from neck. None, 1 or 2 pairs of eyes present; with or without eyespots (ocelli) on caudal sucker and lateral margins of urosome. Cocoons attached to substrates, not held on ventral side of adults. Parasitic on fishes.

Myzobdella LEIDY, 1851

Piscicolidae. Body cylindrical, divided into trachelosome and urosome; without dorsal papillae and without lateral extensions of urosome; 12 - 14 annuli per somite in midbody. Suckers weakly developed; not of greater diameter than body. Five pairs of testes present. Parasites on marine and freshwater fishes.

M. platense (CORDERO, 1933): *Hoplias malabaricus*: Uruguay.

Description unavailable.

M. uruguayensis MAÑÉ-GARZÓN & MONTERO, 1977: *Rhamdia sapo*: Uruguay. (Fig. 11 - 10).

Body – 8.7 - 12.7 x 0.83 - 1.04 mm. Pharynx – 1.35 - 1.68 x 0.18 - 0.30 mm. Testes – 0.45 - 0.53 mm in diameter.

Pentastomida

I. Definition and morphology

Pentastomids are worm-like endoparasitic arthropods with obscure affinities. Formerly the group was considered a subphylum of Arthropoda, but in more recent years, the tendency among most zoologists has been to recognize Pentastomida as a separate phylum. Adult pentastomids are found mainly in the lungs of reptiles and the young (nymphs) occur encysted in the internal organs of many vertebrates including fish and men. Adults range from 1 to 20 cm in length, and have cylindrical or flattened bodies which are expanded anteriorly. The sexes are separate and fertilization is internal. The name pentastomid means "fivemouthed" and comes from the fact that on each side of the mouth slit there are two other depressions each containing a retractible claw (making a total of 5 mouth-like slits).

The pentastomids so far reported in fish have all been young, or nymphal stages. They are ordinarily encysted and they can be recognized by their cylindrical, annulated bodies and their peculiar claws (Fig. 10 - 43).

II. Life-cycle and transmission

The pentastomid life-cycle involves an intermediate and a definitive host, both of which are vertebrates. Fish act as intermediate hosts for those that mature in crocodilians, and most of these belong to the genus *Sebekia.* The adults live in the air passages of the lungs where they copulate. Females produce eggs which pass to the external environment in the host's feces. When the eggs are ingested by a fish, they hatch in the intestinal tract and four-legged larvae, somewhat resembling mites emerge. These larvae make their way through the wall of the intestine aided by the legs which are tipped with small claws. Once within the tissues of the fish, the larvae metamorphose into nymphs, molting several times as they grow. After an infected fish is eaten by a crocodilian, the larvae make their way to the lungs where they mature.

III. Pathology

The passage of larval pentastomids through the intestinal wall of a fish could probably provoke a localized inflammation, but this has not been documented. The presence of nymphs in the mesenteries and other organs causes localized inflammatory reactions leading to fibrotic encapsulation. After complete encapsulation, no further histopathology is observed.

IV. Prevention and treatment

Crocodilians should not be permitted to inhabit ponds where fish are grown. Care should also be taken not to introduce mud, or other material that might be contaminated with crocodilian feces, into fish ponds and aquaria. No specific treatment is possible or necessary for fish already having encysted nymphs.

V. Collection and study methods

Pentastomid nymphs can be studied in temporary phenol preparations after first dehydrating them partially in 95 % alcohol. Permanent whole mounts can be made by the methods described in Chapter 6 for nematodes. Claws can be dissected out with needles and mounted separately for comparative studies.

VI. Identification

It is not presently possible to identify pentastomid nymphs from fish to species. It is presumed that all are *Sebekia*, but since there are several species in the genus, life-cycle studies would need to be performed in order to identify specific differences at the nymphal level.

VII. Checklist for Pentastomida

TRAVASSOS et al. (1928) called pentastomid nymphs found in fish, *Porocephalus gracile* (DIESING, 1836). The genus *Porocephalus*, as presently defined by specialists, occurs as an adult in the lungs of snakes and as a nymph in the organs of mammals. *Porocephalus* nymphs probably do not occur in fish. The pentastomid nymphs from fish are all thought to represent species of *Sebekia*, and these have been reported from the following hosts:

Astronotus ocellatus
Astyanax mexicanus
Bagrus pemecus
Electrophorus electricus
Gymnotus carapo
Hemisorubim platyrhynchus
Hoplias malabaricus
Pellona castelnaeana
Phractocephalus hemiliopterus
Pimelodus megacephalus
Pimelodus vituga
Pinirampus pirinampu
Potamotrygon motoro
Pseudoplatystoma tigrinum
Rhaphiodon vulpinus
Salminus brevidens
Serrasalmus piraya
Stenarchus albifrons
Symbranchus marmoratus
Tachysurus hertzbergii

Miscellaneous pathological conditions

Tropical Gill-Rot:

One of the most common disease conditions found in pond reared fish in the tropics is gill rot. By the time the problem is noted, the disease has frequently advanced beyond the point of treatment. Affected fish are usually observed to swim sluggishly or erratically and spend much time at the surface gasping for breath. A cursory examination of the gills of such fish will show them to be ragged, whitish, with localized hemorrhaging areas and much mucus. Closer inspection may reveal parasites, such as Myxozoa, Ciliophora and Monogenoidea. Localized or generalized fungal growths may also be visible. Many kinds of bacteria will also be present.

The immediate cause of death in these cases is asphixia, and the moment of death will be advanced, of course, if there should be any drop in the level of dissolved oxygen in the water. In natural, or outdoor, ponds there is a normal slump in oxygen level every night because at sundown photosynthesis stops abruptly. Typically, a pisciculturist, whose fish are "doing fine", arrives at his pond some morning and finds about half of them dead and floating around on the surface. He gathers some and dead fish in hand goes to consult an ichthypathologist or a veterinarian to find out how to save the survivors. But it is too late. Treatment at this point will ordinarily hasten rather than prevent death.

Although the immediate cause of death in gill rot infections is asphixia caused by gill inefficiency, the root cause is malnutrition. The condition described above is symptomatic of deficiencies in vitamins A and C and proteins. The cause of the root cause boils down to a matter of simple economics or human greed. The pisciculturist, like any businessman, wants to maximize profit and minimize expense. Since vitamins and proteins cost more than carbohydrates, he puts a minimal amount of these in the ration he feeds his fish. The result is frequently gill rot.

Encysted parasites and foreign bodies:

An inspection of the interior of any wild-caught tropical fish will usually reveal the presence of numerous "white spots" of various sizes and shapes. These represent invaders that the fish has been able to immobilize in fibrous capsules. Most invaders reach the body cavity by passing through the intestinal wall, but many of them are stopped within the wall itself (Fig. 11 - 2). Those that reach the other side often end up in the mesentery that supports the intestine (Fig. 11 - 1). Herbivorous and omnivorous fish frequently have their stomachs and intestines pierced by plant spines, which also become encapsulated (Fig. 11 - 4). The skin barrier is more effective, but is also breached at times (Fig. 11 - 3). Occasional oddities turn up in the intestinal walls of fish, such as larval mites and insects. In order to find out what is inside the "white spots", it is best to excise them, partially dehydrate them in 95 % alcohol and clear them in pure phenol.

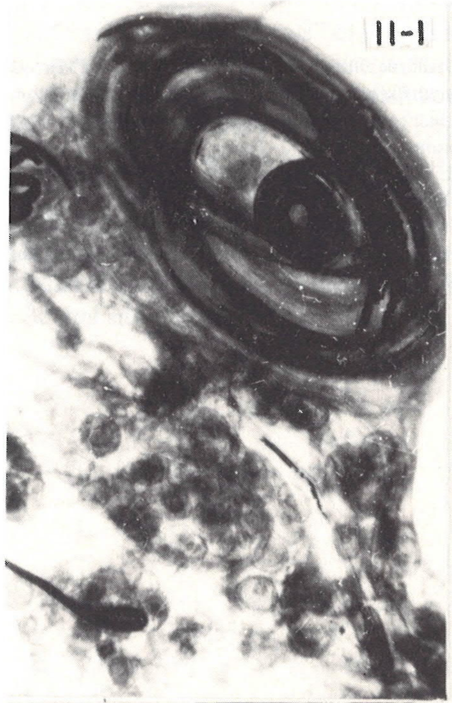
VIII. Plates of Hirudinea and miscellaneous pathological conditions (Fig. 11 - 1 to 11 - 10)

(Explanation of figures)

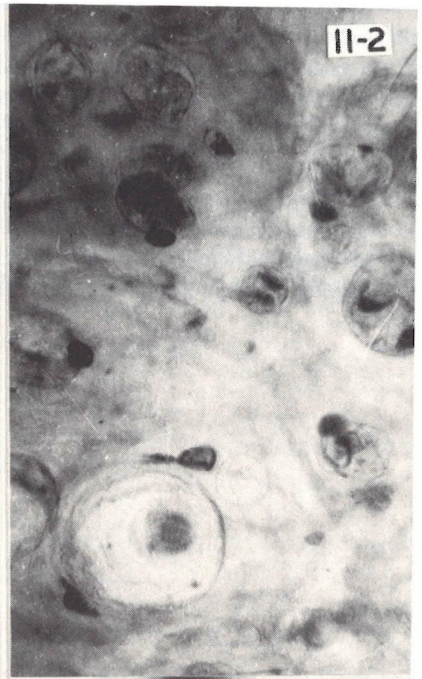
11 - 1. Encysted nematode and cestode larvae in fish mesentery. 11 - 2. Plerocercoids of Proteocephalidae (Cestoda) in intestinal wall of *Chaetobranchus semifasciatus*. 11 - 3. Histological section of unidentified fungus in skin of *Colossoma macropomum*. 11 - 4. Spine in early stage of encystment, in intestinal wall of *Colossoma macropomum*.

11 - 5 to 11 - 8. Morphology of a glossiphoniid leech: 11 - 5. Anterior extremity; 11 - 6. Posterior sucker; 11 - 7. Digestive tract; 11 - 8. Base of proboscis.

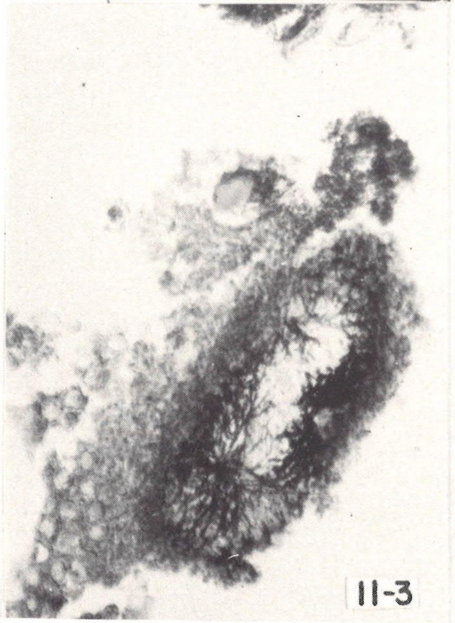
11 - 9. *Theromyzon propinquum*: A. anterior extremity (ventral); B. anterior extremity (dorsal); C. posterior sucker (all after RINGUELET 1947). 11 - 10. *Myzobdella uruguayensis*: entire (after MAÑÉ-GARZÓN & MONTERO 1977).



11-1



11-2



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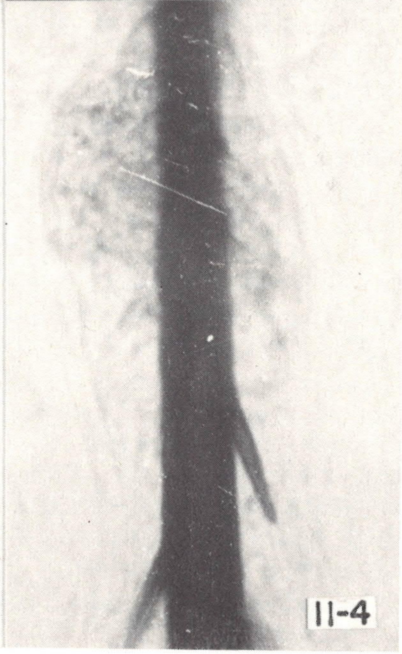
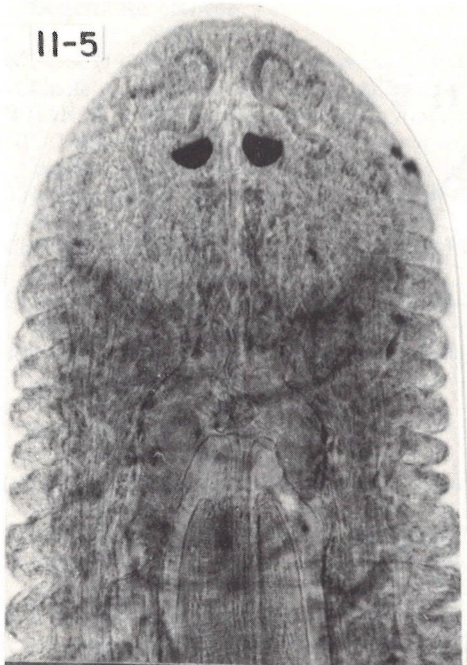
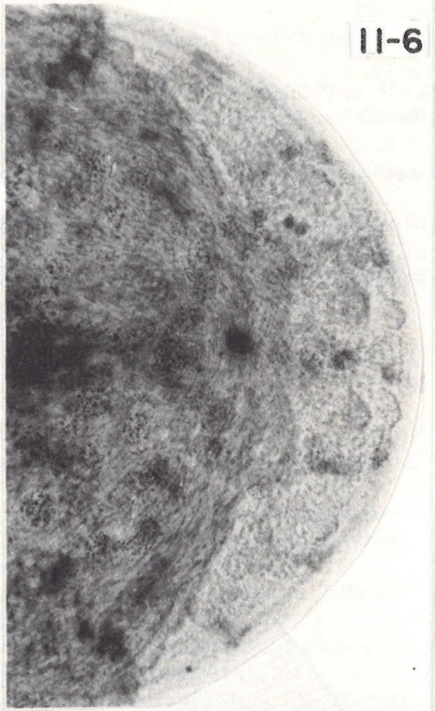


11-4

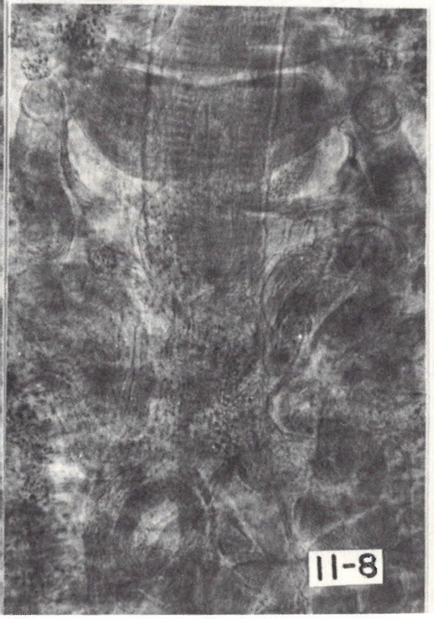


11-5

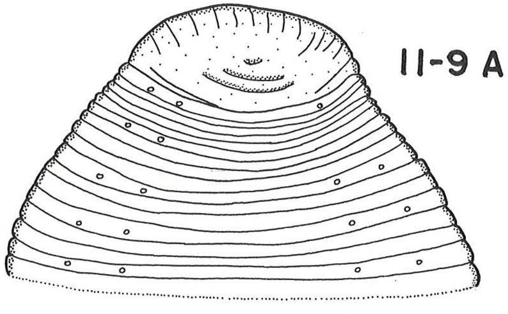


11-6

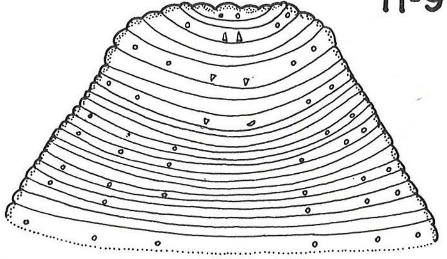
11-7



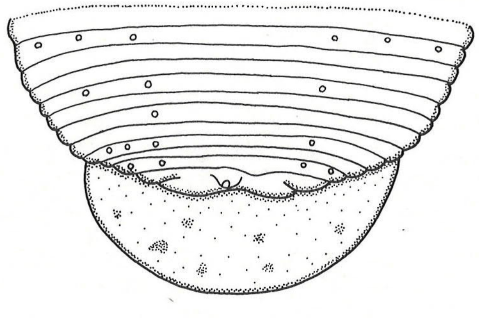
11-8



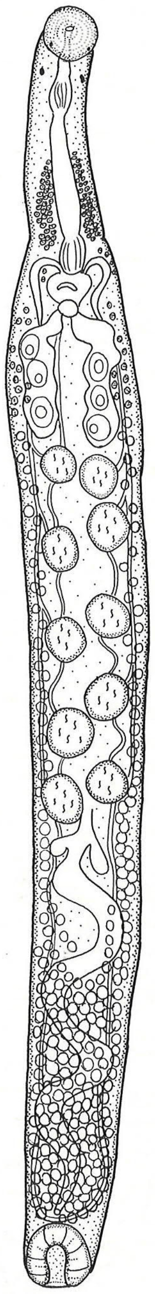
11-9 A



11-9 B



11-9 C



11-10

12. References

General References

HERWIG, N. (1979): Handbook of Drugs and Chemicals Used in the Treatment of Fish Diseases.- Charles C. Thomas, Publ., Springfield Ill: 272 pp.

HOFFMAN, G. L. (1967): Parasites of North American Freshwater Fishes.- Univ. Calif. Press: 486 pp.

KINNE, O. (ed.) (1984): Diseases of Marine Animals, Vol. **IV**, Part 1, Introduction, Pisces.- Biologische Anstalt Helgoland, Hamburg, FRG: i - xv + 541 pp.

OLSEN, O. W. (1974): Animal Parasites, Their Life Cycles and Ecology.- Univ. Park Press, Baltimore: 562 pp.

REICHENBACH-KLINKE, H. H. & M. LANDOLT (1973): Fish Pathology.- TFH Press, Neptune City, N. J.: 512 pp.

RIBELIN, W. E. & G. MIGAKI (eds.) (1975): The Pathology of Fishes.- Univ. Wisconsin Press, Madison, Wisconsin: 1,004 pp.

ROBERTS, R. J. (ed.) (1978): Fish Pathology.- Bailliere Tindall, London: 318 pp.

Protozoa and Ciliophora

BOTELHO, C., Jr. (1907): Sur deux nouveaux trypanosomes des poissons.- C. R. Soc. Biol. Paris **59** (2): 128 - 129.

CHEUNG, P. J., NIGRELLI, R. F. & G. D. RUGGIERI (1983): Coccidian parasite from the liver of the black piranha, *Serrasalmus niger* SCHOMBURGK. (Abstr.).- Eastern Fish Health Workshop, 21 - 23 June, 1983. Nat. Fish Health Res. Lab., Kearneysville, West Virginia: 3 pp.

CUNHA, A. M. & J. C. N. PENIDO (1926): Nouveau protozoaire parasite des poissons: *Zelleriella piscicola* n. sp.- C. R. Soc. Biol. Paris **94:** 1,003.

CUNHA, A. M. & J. C. N. PENIDO (1927): *Rynchodinium paradoxum* n. gen., n. sp. protozoaire parasite d'um poisson d'eau douce.- C. R. Soc. Biol. Paris **97**(36): 1,793 - 1,794.

DADAY, E. (1905): *Nyctotherus piscicola* n. sp. ein neuer Fischparasit aus Südamerika.- Zool. Anz. **28:** 233 - 238.

EARL, P. R. & F. JEMÉNEZ G. (1969): *Nyctotherus dilleri* n. sp. from the fish *Cichlasoma fenestratum* in Veracruz.- Trans. Am. Mic. Soc. **88**(2): 287 - 292.

FONSECA, F. (1935): Trypanosomas de peixes brasileiros. Decrição de uma nova espécie.- Mem. Inst. Butantan **9:** 151 - 184.

FONSECA, F. & Z. VAZ (1928a): Novos trypanosomas de peixes brasileiros.- Ann. Fac. Med. Univ. São Paulo **3:** 69 - 94.

FONSECA, F. & Z. VAZ (1928b): *Trypanosoma francirochai* n. sp. parasito de *Otocinclus francirochai* IHERING, 1928 (peixe de àgua doce do Estado de São Paulo).- Bol. Biol. **11:** 4 - 5.

FONSECA, F. & Z. VAZ (1929): Novas espécies de trypanosomas de peixes brasileiros de ágau doce.- Bol. Biol. **13:** 36 - 41.

FRÓES, O. M., FORTES, E., LIMA, D. F. & V. R. V. LEITE (1978): Três espécies novas de tripanossomas de peixes de água doce do Brasil (Protozoa, Kinetoplastida).- Rev. Brasil. Biol. **38**(2): 461 - 468.

HORTA, P. P. (1910): *Trypanosoma chagasi* n. sp. parasito do *Plecostomus punctatus*.- Brasil Médico **24**(28): 273.

HORTA, P. P. & A. MACHADO (1911): Estudos citológicos sôbre o "*Trypanosoma chagasi*" n. sp. encontrado em peixes do gênero Plecostomus.- Mem. Inst. Oswaldo Cruz **3**(2): 344 - 366.

NEMECZEK, A. (1926): Beiträge zur Kenntnis der Myxosporidenfauna Brasiliens.- Arch. Protistenk. **54**(1): 137 - 149.

OVERSTREET, R. M., HAWKINS, W. E. & J. W. FOURNIE (1984): The coccidian genus *Calyptospora* n. g. and family Calyptosporidae n. fam. (Apicomplexa), with members infecting primarily fishes.- J. Protozool. **31**(2): 332 - 339.

PENIDO, J. C. N. (1927): Quelques nouvelles Myxosporidies parasites des poissons d'eau douce du Brésil.- C. R. Soc. Biol. Paris: **97:** 850 - 852.

PINTO, C. (1928a): *Myxidium gurgeli* nova espécie. Myxosporídeo parasito da vesícula biliar de peixe de água doce do Brasil.- Sci. Med. **6**(2): 86 - 87.

PINTO, C. (1928b): *Henneguya wenyoni* n. sp. myxosporidie parasite des branchies de poisson d'eau douce du Brésil.- C. R. Soc. Biol. Paris **98**(17): 1,580.

PINTO, C. (1928c): *Myxobolus noguchii, M. stokesi* e *Henneguya iheringi*, espécies novas de myxosporídeos de peixes de água doce do Brasil.- Bol. Biol. **12:** 41 - 43.

PINTO, C. (1928d): Myxosporídeos e outros protozoários intestinais de peixes observados na América do Sul.- Arch. Inst. Biol. **1:** 101 - 136 + 42 figs.

SOLANGI, M. A. & R. M. OVERSTREET (1980): Biology and pathogenesis of the coccidium *Eimeria funduli* infecting killifishes.- J. Parasit. **66**(3): 513 - 526.

SPLENDORE, A. (1910): Trypanosomes de poissons brésiliens.- Bull. Soc. Path. Exot. **3:** 521 - 524.

TAYLOR, R. L. (1978): Transmission of salmonid whirling disease by birds fed trout infected with *Myxosoma cerebralis*.- J. Protozool. **25**(1): 105 - 106.

WALLIKER, D. (1969): Myxosporidea of some Brazilian freshwater fishes.- J. Parasitol. **55**(5): 942 - 948.

WOLF, K. (1982): Tubifex worms identified as essential hosts for salmonid whirling disease.- Res. Infor. Bull. U. S. Fish & Wildlife Service: 2 pp.

Monogenoidea

BOEGER, W. A. & D. C. KRITSKY (1988): Neotropical Monogenea. 12. Dactylogyridae from *Serrasalmus nattereri* (Cypriniformes: Serrasalmidae) and aspects of their morphologic variation and distribution in the Brazilian Amazon.- Proc. Helm. Soc. Wash. **55**(2): 188 - 213.

BRANDES, G. (1894): *Fridericianella ovicola* n. g., n. sp. Ein neuer monogenetischer Trematode.- Abh. Naturf. Ges. Halle **20**, Jubiläums-Festschrift: 303 - 310.

BYCHOWSKY, B. E. (1957): Monogenetic Trematodes, their Systematics and Phylogeny.- Akad. Nauk. S. S. S. R. (translated from Russian by AIBS, Washington, D. C.): 509 pp.

HANEK, G., MOLNAR, K. & C. H. FERNANDO (1974): Three new genera of Dactylogyridae (Monogenea) from freshwater fishes of Trinidad.- Parasit. **60:** 911 - 913.

HARRIS, P. D. (1983): The morphology and life-cycle of the oviparous *Oogyrodactylus farlowellae* gen. et sp. nov. (Monogenea, Gyrodactylidae).- Parasit. **87:** 405 - 420.

KOHN, A. & I. PAPERNA (1964): Monogenetic trematodes from aquarium fishes.- Rev. Brasil. Biol. **24:** 245 - 249.

KOHN, A. & C. P. SANTOS (1989): Brazilian Monogenea – List of species, hosts and geographical distribution.- Rev. Brasil. Biol. **49**(3): 809 - 815.

KRITSKY, D. C., BOEGER, W. A. & V. E. THATCHER (1985): Neotropical Monogenea. 7. Parasites of the pirarucu, *Arapaima gigas* (CUVIER), with descriptions of two new species and redescription of *Dawestrema cycloancistrium* PRICE & NOWLIN, 1967 (Dactylogyridae, Ancyrocephalinae).- Proc. Biol. Soc. Wash. **97:** 321 - 331.

KRITSKY, D. C., BOEGER, W. A. & V. E. THATCHER (1986): Neotropical Monogenea. 9. Status of *Trinigyrus* HANEK, MOLNAR & FERNANDO, 1974 (Dactylogyridae) with descriptions of two new species from loricariid catfishes from the Brazilian Amazon.- Proc. Biol. Soc. Wash. **99**(3): 392 - 398.

KRITSKY, D. C., BOEGER, W. A. & V. E. THATCHER (1988): Neotropical Monogenea. 11. *Rhinoxenus*, new genus (Dactylogyridae: Ancyrocephalinae) with descriptions of three new species from the nasal cavities of Amazonian Characoidea.- Proc. Biol. Soc. Wash. **101**(1): 87 - 94.

KRITSKY, D. C. & T. H. FRITTS (1970): Monogenetic trematodes from Costa Rica, with the proposal of *Anacanthoroides* gen. n. (Gyrodactylidae: Isancistrinae).- Proc. Helm. Soc. Wash. **37:** 63 - 68.

KRITSKY, D. C. & P. D. LEIBY (1972): Dactylogyridae (Monogenea) from the freshwater fish, *Astyanax fasciatus* (CUVIER), in Costa Rica, with descriptions of *Jainus hexops* sp. n., *Urocleidoides costaricensis* and *U. heteroancistrium* combs. n.- Proc. Helm. Soc. Wash. **39:** 227 - 230.

KRITSKY, D. C., LEIBY, P. D. & R. J. KAYTON (1978): A rapid stain technique for the haptoral bars of *Gyrodactylus* species (Monogenea).- J. Parasit. **64:** 172 - 174.

KRITSKY, D. C. & V. E. THATCHER (1974a): Monogenetic trematodes (Monopisthocotylea: Dactylogyridae) from freshwater fishes of Colombia, South America.- J. Helm. **48:** 59 - 66.

KRITSKY, D. C. & V. E. THATCHER (1974b): New monogenetic trematodes from freshwater fishes of Western Colombia with the proposal of *Anacanthoroides* gen. n. (Dactylogyridae).- Proc. Helm. Soc. Wash. **43:** 129 - 134.

KRITSKY, D. C. & V. E. THATCHER (1977): *Phanerothecium* gen. nov. and *Fundulotrema* gen. nov., two new genera of viviparous Monogenoides (Gyrodactylidae) with a description of *P. caballeroi* sp. nov. and a key to the subfamilies and genera of the family.- Inst. Biol. México, Publ. Espec. **4:** 53 - 60.

KRITSKY, D. C. & V. E. THATCHER (1983): Neotropical Monogenea. 5. Five new species from the aruanã, *Osteoglossum bicirrosum* VANDELLI, a freshwater teleost from Brazil, with the proposal of *Gonocleithrum* n. gen. (Dactylogyridae: Ancyrocephalinae).- Proc. Biol. Soc. Wash. **96:** 581 - 597.

KRITSKY, D. C. & V. E. THATCHER (1984): Neotropical Monogenea. 6. Five new species of *Diplectanum* (Diplectanidae) from freshwater teleosts, *Plagioscion* spp. (Scianidae), in Brazil.- Proc. Biol. Soc. Wash. **97:** 434 - 443.

KRITSKY, D. C., THATCHER, V. E. & W. A. BOEGER (1986): Neotropical Monogenea. 8. Revision of *Urocleidoides* MIZELLE & PRICE, 1964 (Dactylogyridae, Ancyrocephalinae).- Proc. Helm. Soc. Wash. **53:** 1 - 37.

KRITSKY, D. C., THATCHER, V. E. & W. A. BOEGER (1987): Neotropical Monogenea. 10. *Omothecium* new genus (Dactylogyridae: Ancyrocephalinae) and two new species from piranambu, *Pinirampus pirinampu* (SPIX), (Siluriformes), in Brazil.- Proc. Biol. Soc. Wash. **100** (1): 8 - 12.

KRITSKY, D. C., THATCHER, V. E. & W. A. BOEGER (1988): Neotropical Monogenea. 13. *Rhinonastes pseudocapsaloideum* n. gen., n. sp. (Dactylogyridae, Ancyrocephalinae), a nasal parasite of curimatã, *Prochilodus nigricans* AGASSIZ (Cypriniformes, Prochilodontidae), in Brazil.- J. Parasit. **74**(4): 695 - 698.

KRITSKY, D. C., THATCHER, V. E. & W. A. BOEGER (1989): Neotropical Monogenea. 15. Dactylogyrids from the gills of Brazilian cichlidae with the proposal of *Sciadicleithrum* gen. n. (Dactylogyridae).- Proc. Helm. Soc. Wash. **56**(2): 128 - 140.

KRITSKY. D. C., THATCHER, V. E. & R. J. KAYTON (1979): Neotropical Monogenoidea. 2. The Anacanthorinae PRICE, 1967, with the proposal of four new species of *Anacanthorus* MIZELLE & PRICE, 1965, from Amazon fishes.- Acta Amazônica **9:** 355 - 361.

KRITSKY, D. C., THATCHER, V. E. & R. J. KAYTON (1980): Neotropical Monogenoidea. 3. Five new species from South America, with the proposal of *Tereancistrium* gen. n. and *Trinibaculum* gen. n. (Dactylogyridae: Ancyrocephalinae).- Acta Amazônica **10:** 411 - 417.

MAYES, M. A., BROOKS, D. R. & T. B. THORSON (1981): *Potamotrygonocotyle tsalickisi*, new genus and species (Monogenea: Monocotylidae) and *Paraheteronchocotyle amazonensis*, new genus and species (Monogenea: Hexabothriidae) from *Potamotrygon circularis* GARMAN (Chondrichthyes: Potamotrygonidae) in Northwestern Brazil.- Proc. Biol. Soc. Wash. **94:** 1,205 - 1,210.

MIZELLE, J. D. & D. C. KRITSKY (1967): *Unilatus* gen. n., a unique Neotropical genus of Monogenea.- J. Parasit. **53:** 1,113 - 1,114.

MIZELLE, J. D. & D. C. KRITSKY (1969a): Studies on monogenetic trematodes. XXXIX. Exotic species of Monopisthocotylea with the proposal of *Archidiplectanum* gen. n. and *Longihaptor* gen. n.- Am. Midl. Nat. **81:** 370 - 386.

MIZELLE, J. D. & D. C. KRITSKY (1969b): Studies on monogenetic trematodes. XL. New species from marine and freshwater fishes.- Am. Midl. Nat. **82:** 417 - 428.

MIZELLE, J. D., KRITSKY, D. C. & J. W. CRANE (1968): Studies on monogenetic trematodes. XXXVIII. Ancyrocephalinae from South America with the proposal of *Jainus* gen. n.- Am. Midl. Nat. **80:** 186 - 198.

MIZELLE, J. D. & C. E. PRICE (1964): Studies on monogenetic trematodes. XXVII. Dactylogyrid species with the proposal of *Urocleidoides* gen. n.- J. Parasit. **50:** 579 - 584.

MIZELLE, J. D. & C. E. PRICE (1965): Studies on monogenetic trematodes. XXVII. Gill parasites of the piranha with the proposal of *Anacanthorus* gen. n.- J. Parasit. **51:** 30 - 36.

MOLNAR, K., HANEK, G. & C. H. FERNANDO (1974): Ancyrocephalids (Monogenea) from freshwater fishes of Trinidad.- J. Parasit. **60:** 914 - 920.

NASIR, P. (1983): Occurrence and significance of the monogenean *Cycloplectanum americanum* (PRICE, 1937) OLIVER, 1968, on a freshwater host.- J. Parasit. **69:** 957 - 962.

PRICE, C. E. (1966): *Urocleidus cavanaughi*, a new monogenetic tremadode from the gills of the keyhole cichlid, *Aequidens maroni* (STEINDACHNER).- Bull. Georgia Acad. Sci. **24:** 117 - 120.

PRICE, C. E. (1968): *Diaccessorius*, a new genus of Monogenea from the gills of an Amazon river teleost.- Acta Biol. Venezuelica **6:** 84 - 89.

PRICE, C. E. & W. A. BUSSING (1967): Monogenean parasites of Costa Rican fishes. Part I. Descriptions of two new species of *Cleidodiscus* MUELLER, 1934.- Rev. Parasit. **28:** 81 - 86.

PRICE, C. E. & W. A. BUSSING (1968): Monogenean parasites of Costa Rican fishes. II. Proposal of *Palombitrema heteroancistrium* n. gen., n. sp.- Proc. Helm. Soc. Wash. **35:** 54 - 57.

PRICE, C. E. & T. E. McMAHON (1966): *Monocleithrium*, a new genus of Monogenea from an Amazon River teleost.- Rev. Parasit. **27:** 221 - 226.

PRICE, C. E. & W. J. NOWLIN (1967): Proposal of *Dawestrema cycloancistrium* n. gen., n. sp. (Trematoda: Monogenea) from an Amazon River host.- Rev. Parasit. **28:** 1 - 9.

PRICE, C. E. & N. G. ROMERO (1969): First account of a monogenetic trematode from Paraguay: *Amphocleithrium paraguayensis* n. gen., n. sp.- Zool. Jahrb. **96:** 449 - 452.

PRICE, C. E. & E. A. SCHLUETER (1967): Two new monogenetic trematodes from South America.- J. Tenn. Acad. Sci. **42:** 23 - 25.

PRICE, E. W. (1938): The monogenetic trematodes of Latin America.- Liv. Jub. Prof. LAURO TRAVASSOS, Rio de Janeiro (Brazil) **3:** 407 - 413.

SURIANO, D. M. (1980): *Notodiplocerus singularis* gen. et sp. nov. (Monogenea: Ancyrocephalinae) parásito de las branquias de *Pseudocurimata gilberti* (Pisces: Tetragonopteridae) de la Laguna de Chascomus, República Argentina.- Neotrop. **26:** 131 - 143.

SURIANO, D. M. (1981): *Andospira* n. g., n. sp. (Monogenea, Ancyrocephalinae) a branchial parasite of *Pseudocurimata gilberti* from Lake Chascomus, Argentina.- Neotrop. **27:** 67 - 78.

SZIDAT, L. (1973): Morphologie und Verhalten von *Paragyrodactylus superbus* n. g., n. sp., Erreger eines Fischsterben in Argentinien.- Angew. Parasit. **14:** 1 - 10.

THATCHER, V. E. & D. C. KRITSKY (1983): Neotropical Monogenoidea. 4. *Linguadactyloides brinkmanni* gen. et sp. n. (Dactylogyridae: Linguadactyloidinae subfam. nov.) with observations on its pathology in a Brazilian freshwater fish, *Colossoma macropomum* (CUVIER).- Proc. Helm. Soc. Wash. **50:** 305 - 311.

Trematoda

ASHTON, N., BROWN, N. & D. EASTY (1969): Trematode cataract in freshwater fish.- J. Sm. Animal Pract. **10:** 471 - 478.

BOEGER, W. A. & V. E. THATCHER (1983): *Kalipharynx piramboae* gen. et sp. n. (Trematoda: Fellodistomidae) parasita do peixe pulmonado amazônico, *Lepidosiren paradoxa* FITZINGER.- Acta Amazônica **13**(1): 171 - 175.

BROOKS, D. R. (1977): A new genus and two new species of trematodes from characid fishes in Colombia.- Trans. Am. Mic. Soc. **96**(2): 267 - 270.

DAWES, B. (1946): The Trematoda with Special Reference to British and Other European Forms.- Cambridge Univ. Press, London: 644 pp.

FREEMAN, R. S. (1964): Flatworm problems in fish.- Can. Fish Cult. **32:** 11 - 18.

FREEMAN, R. S., STUART, P. F., CULLEN, J. B., RITCHIE, A. C., MILDON, A., FERNANDES, B. J. & R. BONIN (1976): Fatal human infection with mesocercariae of the trematode *Alaria americana*.- Am. J. Trop. Med. Hyg. **25:** 803 - 807.

HALTON, D. W. (1966): Occurrence of microvilli-like structures in the gut of degenetic trematodes.- Experientiae **22:** 828 - 829.

HALTON, D. W. (1967): Observations on the nutrition of digenetic trematodes.- Parasit. **57:** 639 - 660.

HYMAN, L. R. (1951): The Invertebrates: Platyhelminthes and Rhynchocoela. The Acoelomata Bilateria, Vol. II.- McGraw-Hill Book Co. Inc.: 550 pp.

KOHN, A. (1962): Sôbre um nôvo gênero de trematódeo bucefaliforme parasito de peixe de água doce.- Rev. Brasil. Biol. **22**(4): 351 - 355.

KOHN, A. (1963): *Paurorhynchus schubarti* sp. n., metacercária parasita de dourado (Trematoda, Bucephaliformes).- Rev. Brasil. Biol. **23**(3): 259 - 261.

KOHN, A. (1970a): *Pararhipidocotyle jeffersoni* gen. n., sp. n., trematódeo bucefaliforme parasito de dourado.- Atas Soc. Biol. Rio de Janeiro **13**(5-6): 181 - 183.

KOHN, A. (1970b): *Bellumcorpus schubarti* (KOHN, 1963) comb. nov. para *Paurorhynchus schubarti* KOHN, 1963 (Trematoda, Prosorhynchidae).- Atas Soc. Biol. Rio de Janeiro **13**(5-6): 185 - 186.

PADILHA, T. N. (1978): Caracterização da família Zonocotylidae com redescrição de *Zonocotyle bicaecata* TRAVASSOS, 1948, e descrição de um novo gênero (Trematoda, Digenea).- Rev. Brasil. Biol. **38**(2): 415 - 429.

SCHELL, S. C. (1970): How to Know the Trematodes.- Wm. C. Brown Co. Publ. Dubuque, Iowa: 355 pp.

SKRJABIN, K. I. (ed.) (1947 - 1974): Trematodi Zhivotnikh i Cheloveka [Trematodes of Animals and Man] (In Russian).- Akad. Nauk S. S. S. R. Vol. **I – XXV.**

SZIDAT, L. (1951): Neue Arten der Trematoden-Familie Aporocotylidae aus dem Blut und der Leibeshöhle von Süßwasserfischen des Rio de la Plata.- Z. Parasitenkde. **15:** 70 - 86.

SZIDAT, L. (1954): Trematodes nuevos de peces de água dulce de la República Argentina y intento para aclarar su caracter marino.- Rev. Inst. Nac. Inves. Cien. Nat. Argen. Bernadino Rivadavia Zool. **3**(1): 1 - 85.

TEIXEIRA DE FREITAS, J. F. (1941a): Nôvo trematódeo parasito de peixe de água doce.- Mem. Inst. Oswaldo Cruz **35**(3): 569 - 570.

TEIXEIRA DE FREITAS, J. F. (1941b): Nôvo trematódeo parasito de peixe do rio Miranda.- Rev. Brasil. Biol. **1**(3): 249 - 251.

TEIXEIRA DE FREITAS, J. F. (1947a): *Chalcinotrema salobrensis* n. g., n. sp., (Trematoda, Waretrematidae).- Rev. Brasil. Biol. **7**(4): 461 - 464.

TEIXEIRA DE FREITAS, J. F. (1947b): Nôvo gênero de Haploporinae (Trematoda, Haploporoidea).- Mem. Inst. Oswaldo Cruz **45**(3): 587 - 589.

THATCHER, V. E. (1978): Quatro novas espécies de Haploporidae (Trematoda: Digenea) de peixes de água doce do Colômbia com uma revisão do gênero *Saccocoelioides* SZIDAT, 1954.- Acta Amazônica **8**(3): 477 - 484.

THATCHER, V. E. (1979a): Paramphistomidae (Trematoda: Digenea) de peixes de água doce: dois novos gêneros da Colômbia e uma redescrição de *Dadaytrema oxycephala* (DIESING, 1836) TRAVASSOS, 1934, da Amazônia.- Acta Amazônica **9**(1): 203 - 208.

THATCHER, V. E. (1979b): O primeiro trematódeo negro, *Amazonadistoma negrensis* n. gen., n. sp. (Digenea: Gorgoderidae), parasita de um peixe amazônico.- Acta Amazônica **9**(2): 389 - 392.

THATCHER, V. E. (1979c): *Brasicystis bennetti* n. gen., n. sp. (Trematoda: Didymozoidae) parasita da pescada (Sciaenidae) da Amazônia, Brasil.- Acta Amazônica **9**(4): 747 - 749.

THATCHER, V. E. (1980): Duas novas espécies de *Caballerotrema* (Trematoda: Echinostomatidae) do pirarucu e da aruanã (Osteoglossidae), com uma redefinição do gênero e uma redescrição de *C. brasiliense* PRUDHOE, 1960.- Acta Amazônica **10**(2): 419 - 423.

THATCHER, V. E. (1981): Patologia de peixes da Amazônia brasileira, 1. Aspectos gerais.- Acta Amazônica **11**(1): 125 - 140.

THATCHER, V. E. & M. D. DOSSMAN (1974): *Lecithobotrioides mediacanoensis* n. g., n. sp. (Trematoda: Haploporidae) from a freshwater fish (*Prochilodus reticulatus*) in Colombia.- Trans. Am. Mic. Soc. **93**(2): 261 - 264.

THATCHER, V. E. & M. D. DOSSMAN (1975): *Univoelium prochilodorum* gen. et sp. n. (Trematoda: Haploporidae) from a freshwater fish (*Prochilodus reticulatus*) in Colombia.- Proc. Helm. Soc. Wash. **42**(1): 28 - 30.

THATCHER, V. E. & A. B. VARELLA (1980): Patologia de peixes da Amazônia brasileira, 2. Um tumor maligno das brânquias relacionado com as metacercárias de um trematódeo.- Acta Amazônica **10**(3): 651 - 656.

THATCHER, V. E. & A. B. VARELLA (1981): Duas novas espécies de *Megacoelium* SZIDAT, 1954 (Trematoda: Haploporidae) parasitos estomacais de peixes da Amazônia brasileira, com uma redefinição do gênero.- Acta Amazônica **11**(2): 285 - 289.

TRAVASSOS, L. (1933): Sur un nouveau trématode de poissons de la vallée do fleuve Parahyba.- C. R. Soc. Biol., Paris **114:** 839 - 840.

TRAVASSOS, L. (1934): Sinopse dos Paramphistomoidea.- Mem. Inst. Oswaldo Cruz **29**(1): 19 - 178.

TRAVASSOS, L. (1948a): Contribuição ao conhecimento dos helmintos dos peixes de água doce do Brasil. I. *Zonocotyle bicaecata* n. g., n. sp., (Trematoda, Aspidogastridae).- Mem. Inst. Oswaldo Cruz **45**(2): 513 - 516.

TRAVASSOS, L. (1948b): Contribuição ao conhecimento dos helmintos dos peixes de água doce do Brasil. II. *Iheringtrema iheringi* n. g., n. sp., (Trematoda, Heterophyidae).- Mem. Inst. Oswaldo Cruz **45**(2): 517 - 520.

TRAVASSOS, L. (1961): Sôbre um nôvo trematódeo parasito de intestino de peixes de água doce do Brasil. *Curumai curumai* gen. nov., sp. nov. (Trematoda, Angiodictyidae).- Atas Soc. Biol. Rio de Janeiro **5**(1-2): 1 - 4.

TRAVASSOS, L. & A. KOHN (1965): Lista dos helmintos parasitos de peixes encontrados na Estação Experimental de Biologia e Piscicultura de Emas, Pirassununga, Estado de São Paulo.- Pap. Avuls. Dept. Zool. S. Paulo **17**(5): 35 - 52.

TRAVASSOS, L., TEIXEIRA DE FREITAS, J. F. & A. KOHN (1969): Trematódeos do Brasil.- Mem. Inst. Oswaldo Cruz **67**: 1 - 886.

WILLEY, C. H. (1930): Studies on the lymph system of digenetic trematodes.- J. Morph. **50:** 1 - 30.

WOTTON, R. M. & F. SOGANDARES-BERNAL (1963): A report on the occurrence of microvillus-like structures in the caeca of certain trematodes (Paramphistomidae).- Parasit. **53:** 157 - 161.

YAMAGUTI, S. (1953): Systema Helminthum, Part I., Digenetic Trematodes of Fishes.- Publ. by author, Tokyo: 405 pp.

YAMAGUTI, S. (1958): Systema Helminthum, Vol. I., Pts. 1 & 2, The Digenetic Trematodes of Vertebrates.- Interscì. Publ. Co., N. Y.: 1,575 pp.

YAMAGUTI, S. (1971): Synopsis of the Digenetic Trematodes of Vertebrates.- 2 vols., Keigaku Co., Tokyo: 1,074 pp.

Cestodaria and Cestoda

BROOKS, D. R., MAYES, M. A. & T. B. THORSON (1981): Systematic review of cestodes infecting freshwater stingrays (Chondrichthyes: Potamotrygonidae) including four new species from Venezuela.- Proc. Helm. Soc. Wash. **48**(1): 43 - 64.

BROOKS, D. R. & T. B. THORSON (1976): Two tetraphyllidean cestodes from the freshwater stingray *Potamotrygon magdalenae* DUMERIL, 1852 (Chondrichthyes: Potamotrygonidae) from Colombia.- J. Parasit. **62**(6): 943 - 947.

DÍAZ-UNGRÍA, C. (1973): Helmintos endoparásitos de Venezuela.- Cien. Vet. Maracaibo **3**(1-2): 37 - 244.

DÖNGES, J. & W. HARDER (1966): *Nesolecithus africanus* n. sp. (Cestodaria, Amphilinidae) aus dem Coelom von *Gymnarchus niloticus* CUVIER 1829 (Teleostei).- Z. Parasitenkde. **28:** 125 - 141.

MAYES, M. A., BROOKS, D. R. & T. B. THORSON (1978): Two new species of *Acanthobothrium* VAN BENEDEN, 1848 (Cestoidea, Tetraphyllidea) from freshwater stingrays in South America.- J. Parasit. **64**(5): 838 - 841.

REGO, A. A. (1979): Contribuição ao conhecimento dos helmintos de raias fluviais Paratrygonidae.- Rev. Brasil. Biol. **39**(4): 879 - 890.

REGO, A. A. (1980): Encontro de plerocercos de Trypanorhyncha (Cestoda) em ofídio de rio da América do Sul.- Mem. Inst. Butantan **44/45:** 239 - 243.

REGO, A. A. (1982): Identificação de Temnocephalida (Turbellaria) e de plerocercos de Trypanorhyncha (Cestoda) encontrados em caranguejos de água doce.- Rev. Brasil. Biol. **42**(2): 275 - 278.

REGO, A. A. (1984): Proteocefalídeos (Cestoda) de *Phractocephalus hemiliopterus*, peixe da Amazônia.- Mem. Inst. Oswaldo Cruz **79**(2): 257 - 261.

REGO, A. A. (1985): Proteocephalidea from Amazonian freshwater fishes: new systematic arrangement for the species described by WOODLAND as *Anthobothrium* (Tetraphyllidea).- Parasitol. al Día (Santiago, Chile) **9:** 4 - 9.

REGO, A. A., SANTOS, J. C. DOS & P. P. SILVA (1974): Estudos de cestóides de peixes do Brasil.- Mem. Inst. Oswaldo Cruz **72**(3/4): 187 - 204.

REGO, A. A. & A. P. LUNA DIAS (1976): Estudos de cestóides de peixes do Brasil 3a Nota: Cestóides de raias fluviais Paratrygonidae.- Rev. Brasil. Biol. **36**(4): 941 - 956.

SKRJABIN, K. I. (ed.) (1965): Osnovi Tsestodologii, Tom. V.: V. I. FREZE: Proteotsefalyati lentochni gelminti rib, amfibii i reptilii.- Akad. Nauk. S. S. S. R.: 538 pp.

STUNKARD, H. W. (1962): The organization, ontogeny and orientation of the Cestoda.- Quart. Rev. Biol. **37**(1): 23 - 34.

WARDLE, R. A. & J. A. McLEOD (1952): The Zoology of Tapeworms.- Univ. of Minnesota Press, Minneapolis: 780 pp.

WARDLE, R. A., McLEOD, J. A. & S. RADINOVSKY (1974): Advances in the Zoology of Tapeworms.- Univ. of Minnesota Press, Minneapolis: 274 pp.

WOODLAND, W. N. F. (1925): On three new proteocephalids (Cestoda) and a revision of the genera of the family.- Parasit. **17**(4): 370 - 394.

WOODLAND, W. N. F. (1933a): On the anatomy of some fish cestodes described by DIESING from the Amazon.- Quart. J. Microsc. Sci. **76:** 175 - 208.

WOODLAND, W. N. F. (1933b): On two new cestodes from the Amazon siluroid fish *Brachyplatystoma vaillanti* CUV.- Parasit. **25**(4): 486 - 490.

WOODLAND, W. N. F. (1933c): On a new subfamily of proteocephalid cestodes – the Othinoscolecinae – from the Amazon siluroid fish *Platystomatichthys sturio* (KNER).- Parasit. **25**(4): 491 - 500.

WOODLAND, W. N. F. (1934a): On six new cestodes from Amazon fishes.- Proc. Zool. Soc. London **1:** 33 - 44.

WOODLAND, W. N. F. (1934b): On the Amphilaphorchidinae, a new subfamily of proteocephalid cestodes, and *Myzophorus admonticellia*, gen. et sp. n., parasitic in *Pirinampus* spp. from the Amazon.- Parasit. **26**(1): 141 - 149.

WOODLAND, W. N. F. (1934c): On some remarkable new cestodes from Amazon siluroid fish.- Parasit. **27**(2): 208 - 225.

WOODLAND, W. N. F. (1935a): Some new proteocephalids and a ptychobothriid (Cestoda) from the Amazon.- Proc. Zool. Soc. London **3:** 619 - 624.

WOODLAND, W. N. F. (1935b): Some more remarkable cestodes from Amazon siluroid fish.- Parasit. **28**(2): 207 - 225.

WOODLAND, W. N. F. (1935c): Additional cestodes from the Amazon siluroids, pirarara, dorad and sudobim.- Proc. Zool. Soc. London **4:** 851 - 862.

YAMAGUTI, S. (1959): Systema Helminthum, Vol. II. The Cestodes of Vertebrates.- Intersci. Publ., N. Y.: 860 pp.

Nematoda

BAYLIS, H. A. (1923): Some parasitic worms from *Arapaima gigas* (teleostean fish) with a description of *Philometra senticosa* n. sp. (Filarioidea).- Parasit. **19**(1): 35 - 47.

DEARDORFF, T. L., BROOKS, D. R. & T. B. THORSON (1981): A new species of *Echinocephalus* (Nematoda: Gnathostomidae) from neotropical stingrays with comments on *E. diazi*.- J. Parasit. **67**(3): 433 - 439.

DÍAZ-UNGRÍA, C. (1968): Helmintos de peces de Venezuela con descripción de un genero y tres especies nuevas.- Bol. Soc. Venez. Cien. Nat. **27**(113 - 114): 537 - 570.

DRASCHE, R. VON (1884): Revision der in der Nematoden-Sammlung des K. K. Zoologischen Hofcabinetes befindlichen Originalexemplare Diesing's und Moli.- Verh. K. K. Zool. Bot. Ges. Wien **33:** 107 - 118.

FERNANDES, M. T., CAMPOS, M. S. & P. T. ARTIGAS (1983): *Travnema araujoi* n. sp. (Nematoda: Pharyngodonidae) parasito de *Curimatus gilberti* QUOY & GAIMARD (Pisces, Characinidae).- Rev. Fac. Med. Vet. Zootec. Univ. São Paulo **20:** 35 - 41.

FERRAZ, E. & V. E. THATCHER (1988): *Bacudacnitis grandistomis* gen. et sp. nov. (Nematoda: Cucullanidae) parasita intestinal de um bagre, *Pseudodoras niger* (VALENCIENNES) da Amazônia Brasileira.- Amazoniana **10**(3): 249 - 253.

FERRAZ, E. & V. E. THATCHER (1990): *Camallanus acaudatus* sp. n. (Nematoda, Camallanidae) e uma descrição do macho de *Camallanus tridentatus* (DRASCHE, 1884), parasitas de peixes da Amazônia Brasileira.- Amazoniana **11**(2): 135 - 145.

GONÇALVES DA COSTA, S. C. (1962): Aspectos biológicos do gênero *Rondonia* TRAVASSOS, 1920 (Nematoda, Atractidae).- Arq. Mus. Nac. Rio de Janeiro **52:** 75 - 78.

KLOSS, G. R. (1966): Helmintos parasitos de espécies simpátricas de *Astyanax* (Pisces, Characidae). I.- Pap. Avuls. Dept. Zool. Univ. São Paulo **17:** 35 - 42.

KOHN, A. & B. M. M. FERNANDES (1987): Estudo comparativo dos helmintos parasitos de peixes do rio Mogi Guassu, coletados nas excursões realizadas entre 1927 e 1985.- Mem. Inst. Oswaldo Cruz **82**(4): 483 - 500.

KOHN, A. & B. M. M. FERNANDES (1988): Helminth parasites of fishes from the hydroelectric power station of ELETROSUL (Brazil). I. *Procamallanus petterae* n. sp. and *Spirocamallanus pintoi* n. sp. (Nematoda: Camallanidae) from the reservoir of "Salto Osório".- Mem. Inst. Oswaldo Cruz **83**(3): 293 - 298.

KOHN, A., FERNANDES, B. M. M., MACEDO, B. & B. ABRAMSON (1985): Helminth parasites of freshwater fishes from Pirassununga, SP, Brazil.- Mem. Inst. Oswaldo Cruz **80**(3): 327 - 336.

KOHN, A., FERNANDES, B. M. M., PIPOLO, H. V. & M. P. DE GODOY (1988): Helmintos parasitos de peixes das usinas hidreléctricas da ELETROSUL (Brazil). II. Reservatórios de Salto Osório e de Salto Santiago, Bacia do rio Iguaçu.- Mem. Inst. Oswaldo Cruz **83**(3): 229 - 303.

KOHN, A., FERNANDES, B. M. M., PIPOLO, H. V. & M. P. DE GODOY (1989): List of helminth parasites of fishes from the Passo Fundo reservoir, Uruguay river basin, Brazil.- Mem. Inst. Oswaldo Cruz **84**(3): 427 - 428.

MAGALHÃES PINTO, R. & D. NORONHA (1972): Redescrição de *Procamallanus inopinatus* TRAVASSOS, ARTIGAS & PEREIRA, 1928 (Nematoda, Camallanoidea).- Atas. Soc. Biol. Rio de Janeiro **15**(2): 105 - 108.

MAGALHÃES PINTO, R., FÁBIO, S. P. DE, NORONHA, D. & T. ROLAS (1974): *Procamallanus brasileiros* – Parte 1 (Nematoda, Camallanoidea).- Mem. Inst. Oswaldo Cruz **72**(3/4): 205 - 211, pls. I - V.

MAGALHÃES PINTO, R., FÁBIO, S. P. DE, NORONHA, D. & T. ROLAS (1975): Novas contribuições ao conhecimento do gênero *Procamallanus* (Nematoda, Camallanoidea).- Mem. Inst. Oswaldo Cruz **73**(3): 183 - 191.

MAGALHÃES PINTO, R., FÁBIO, S. P. DE, NORONHA, D. & T. ROLAS (1976a): Novas considerações morfológicas e sistemáticas sobre os *Procamallanus brasileiros*.- Mem. Inst. Oswaldo Cruz **74**(1): 77 - 84.

MAGALHÃES PINTO, R., FÁBIO, S. P. DE, NORONHA, D. & T. ROLAS (1976b): *Procamallanus brasileiros* (Nematoda, Camallanoidea). Considerações finais, com chave para determinação das espécies.- Mem. Inst. Oswaldo Cruz **74**(3-4): 323 - 339.

PETTER, A. J. (1974): Deux nouvelles espèces de Nématodes parasites de *Hoplerythrinus unitaeniatus* (Characidae, Cypriniformes) en Guyana; création d'une nouvelle famille: les Guyanemidae (Dracunculoidea).- Bull. Mus. natn. Hist. nat. Paris, 3° sér., n° 232, Zool. **156:** 803 - 812.

PETTER, A. J. (1984): Nématodes de poissons du Paraguay. II. Habronematoidea (Spirurida). Description de 4 espèces nouvelles de la famille des Cystidicolidae.- Rev. suisse Zool. **91:** 935 - 952.

PETTER, A. J. (1987): Nématodes de poissons de l'Equateuer.- Rev. suisse Zool. **94:** 61 - 76.

PETTER, A. J. & J. CASSONE (1984): Nématodes de poissons du Paraguay. I. Ascaridoidea: *Sprentascaris* n. gen.- Rev. suisse Zool. **91:** 617 - 634.

PETTER, A. J. & C. DLOUHY (1985): Nématodes de poissons du Paraguay. III. Camallanina. Description d'une espèce et d'une sous-espèce nouvelles de la famille des Guyanemidae.- Rev. suisse Zool. **92:** 165 - 175.

PETTER, A. J. & S. MORAND (1988): Nématodes de poissons du Paraguay. IV. Redescription de *Spinitectus jamundensis* THATCHER & PADILHA, 1977 (Cystidicolidae, Nematoda).- Rev. suisse Zool. **95:** 377 - 384.

PETTER, A. J. & V. E. THATCHER (1988): Observations sur la capsule buccale de *Spirocamallanus inopinatus* (Nematoda), parasite de poissons brésiliens.- Bull. Mus. natn. Hist. nat. Paris, 4° sér., 10, section A, n° 4: 685 - 692.

SANTOS, E. DOS, VICENTE, J. J. & C. R. JARDIM (1979): Helmintos de peixes de rios amazônicos da coleção helmintológica do Instituto Oswaldo Cruz. II. Nematoda.- Atas Soc. Biol. Rio de Janeiro **20:** 11 - 19.

TEIXEIRA DE FREITAS, J. F. & N. IBAÑEZ (1968): Fauna helmintológica del Perú: nueva espécie del género *Spirocamallanus* OLSEN, 1952 (Nematoda, Camallanoidea).- Bol. Chileno Parasit. **23**(3-4): 146 - 148.

TEIXEIRA DE FREITAS, J. F. & N. IBAÑEZ (1970): Fauna helmintológica del Perú: nuevo nemátodo camallanideo parásito de péz.- Arch. Peruanos Pat. clin. **24:** 205 - 210.

TEIXEIRA DE FREITAS, J. F. & H. LENT (1935): Capilariinae de animais de sangue frio (Nematoda: Trichuroidea).- Mem. Inst. Oswaldo Cruz **30**(2): 241 - 284.

TEIXEIRA DE FREITAS, J. F. & H. LENT (1946): Infestação de apaiarís "*Astronotus ocellatus*" (AGASSIZ) pelo nematódeo *Goezia spinulosa* (DIESING, 1839).- Rev. Brasil. Biol. **6**(2): 215 - 222.

THATCHER, V. E. & T. N. PADILHA (1977): *Spinitectus jamundensis* sp. n. (Nematoda, Spiruroidea) from a Colombian freshwater fish, *Prochilodus reticulatus* STEIND.- Rev. Brasil. Biol. **37**(4): 799 - 801.

TRAVASSOS, L. (1919): Informações sobre o material helmintológico colecionado na Ilha da Trindade em 1916.- Arch. Mus. Nac. Rio de Janeiro **22:** 159 - 167.

TRAVASSOS, L. (1923): Informações sobre a fauna helmintológica de Mato Grosso, Oxyuroidea, Kathlaniidae.- Follha Méd. **4**(4): 29 - 30.

TRAVASSOS, L. (1927): Uma nova espécie parasita de peixes de água doce, *Capillaria senticosa* n. sp.- Bol. Biol. **10:** 215 - 217, 4 figs.

TRAVASSOS, L. (1948a): Contribuição ao conhecimento dos helmintos dos peixes de água doce do Brasil. III. Duas novas espécies do gênero *Cucullanus* MUELLER, 1877.- Mem. Inst. Oswaldo Cruz **45**(3): 551 - 554.

TRAVASSOS, L. (1948b): Contribuição ao conhecimento dos helmintos dos peixes de água doce do Brasil. IV. Dois novos gêneros de Cosmocercidae (Nematoda) e uma nota de nomenclatura helmintológica.- Mem. Inst. Oswaldo Cruz **46**(3): 633 - 637.

TRAVASSOS, L. (1960): Sobre nematódeos cavitários de peixes do Rio Amazonas.- Atas Soc. Biol. Rio de Janeiro **4**(2): 15 - 20, 14 figs.

TRAVASSOS, L. & A. KOHN (1965): Lista dos helmintos de peixes encontrados na Estação Experimental de Biologia de Emas, Pirassununga, Estado de São Paulo.- Pap. Avuls. Dept. Zool. Univ. São Paulo, Brasil **17:** 35 - 42.

TRAVASSOS, L., ARTIGAS, P. & C. PEREIRA (1928): Fauna helmintológica dos peixes de água doce do Brasil.- Arq. Inst. Biol. São Paulo **1:** 5 - 68.

VAZ, Z. & C. PEREIRA (1935): Contribuição ao conhecimento dos nematóides de peixes fluviais do Brasil.- Arq. Inst. Biol. São Paulo **5:** 87 - 103.

YAMAGUTI, S. (1961): Systema Helminthum, Vol. III (Parts I & II). The Nematodes of Vertebrates.- Intersci. Publ. N. Y.: 1,261 pp.

Acanthocephala

CONWAY MORRIS, S. (1982): The origins and evolution of the Acanthocephala.- Biol. Rev. **57:** 85 - 115.

DÍAZ-UNGRÍA, C. & A. GRACIA-RODRIGO (1957): Revisión de la familia Quadrigyridae (Acanthocephala) con descripción de *Deltania scorzai* gen. n. sp. n.- Novedades Cient. (Caracas), ser. Zool. **22:** 1 - 29.

DÍAZ-UNGRÍA, C. & A. GRACIA-RODRIGO (1959): Acantocéfalos de Venezuela.- Rev. Vet. Venez. **6**(31): 82 - 105.

DÍAZ-UNGRÍA, C. & A. GRACIA-RODRIGO (1960): Revisiíon del género *Polyacanthorhynchus* TRAVASSOS, 1920 (Acanthocephala) con descripciíon de una especie nueva.- In: Libro Homenaje al Dr. E. Caballero y Caballero.- Esc. Nac. Cienc. Biol. y Inst. Polytec. Nac. Secret. Educ. Pub. Mexico: 429 - 433.

GOLVAN, Y. J. (1956): Acanthocéphales d'Amazonie. Redescription *Oligacanthorhynchus iheringi* TRAVASSOS, 1916 et *Neoechinorhynchus buttnerae* n. sp. (Neoacanthocephala, Neoechinorhynchidae).- Ann. Parasit. Hum. Comp. **31**(5/6): 500 - 524.

GOLVAN, Y. J. (1958): Le phylum des Acanthocephala. Premiére note. Sa place dans l'échelle zoologique.- Ann. Parasit. Hum. Comp. **33**(5/6): 538 - 602.

GOLVAN, Y. J., GRACIA-RODRIGO, A. & C. DÍAZ-UNGRÍA (1964): *Megapriapus ungriai* (GRACIA-RODRIGO, 1960) n. gen. (Palaeacanthocephala) parasite d'une Pastenague d'eau douce du Vénézuéla (*Potamotrygon hystrix*).- Ann. Parasit. Hum. Comp. **39**(1): 53 - 59.

GRACIA-RODRIGO, A. (1959): Acantocéfalos parásitos de los peces en Venezuela.- Doctoral thesis, Fac. Vet. Univ. Cent. (Madrid): 32 pp.

MACHADO FILHO, D. A. (1941a): Pesquisas helmintológicas realizadas no Estado de Mato Grosso – Acanthocephala.- Mem. Inst. Oswaldo Cruz **35**(3): 593 - 601.

MACHADO FILHO, D. A. (1941b): Sôbre alguns acantocéfalos provenientes do Estado de Mato Grosso.- Rev. Brasil. Biol. **1**(1): 57 - 61.

MACHADO FILHO, D. A. (1947): Revisão do gênero *Polyacanthorhynchus* TRAVASSOS, 1920 (Acanthocephala, Rhadinorhynchidae).- Rev. Brasil. Biol. **7**(2): 195 - 201.

MACHADO FILHO, D. A. (1954): Uma nova espécie do gênero "*Neoechinorhynchus*" (HAMANN) (Neoechinorhynchidae, Acanthocephala).- Rev. Brasil. Biol. **14**(1): 55 - 57.

MACHADO FILHO, D. A. (1959a): "*Neoechinorhynchus spectabilis*" sp. n. (Neoechinorhynchidae, Acanthocephala).- Rev. Brasil. Biol. **19**(2): 191 - 194.

MACHADO FILHO, D. A. (1959b): Uma nova espécie do gênero "*Neoechinorhynchus*" HAMANN, 1892 parasita de "Peixe-Martim" do Paraguai (Neoechinorhynchidae, Archiacanthocephala).- Rev. Brasil. Biol. **19**(4): 379 - 381.

MACHADO FILHO, D. A. (1960): Um novo gênero da família Quadrigyridae VAN CLEAVE, 1920 (Metacanthocephala, Palaeacanthocephala).- Rev. Brasil. Biol. **20**(1): 79 - 84.

MAÑÉ- GARCÓN, F. & E. DEI-CAS (1974): Un acanthocéphale nouveau *Wolffhugelia matercula* n. gen., n. sp. de l'intestin de *Fitzroyia lineata* (JENYNS) (Poisson) en Uruguay.- Ann. Parasit. Hum. Comp. **49**(1): 83 - 89.

NICKOL, B. B. & V. E. THATCHER (1971): Two new acanthocephalans from neotropical fishes: *Neoechinorhynchus prochilodorum* sp. n. and *Gorytocephalus plecostomorum* gen. et sp. n.- J. Parasit. **57**(3): 576 - 581.

NICKOL, B. B. & T. N. PADILHA (1979): *Neoechinorhynchus paraguayensis* (Acanthocephala: Neoechinorhynchidae) from Brazil.- J. Parasit. **65**(6): 987 - 989.

PETROCHENKO, V. I. (1956): Acanthocephala of Domestic and Wild Animals. Vol. I.- Akad. Nauk. S. S. S. R. (Translated from Russian by Israel Prog. Sci. Transl., Jerusalem, 1971): 465 pp.

SALGADO-MALDONADO, G. (1978): Acantocéfalos de peces IV. Descripción de dos especies nuevas de *Neoechinorhynchus* HAMANN, 1892 (Acanthocephala: Neoechinorhynchidae) y algunas consideraciones sobre este género.- An. Inst. Biol. Univ. Nac. Autón. Mexico 49, ser. Zool. **1:** 35 - 48.

SCHMIDT, G. D. & E. J. HUGGHINS (1973a): Acanthocephala of South American fishes. Part 1. Eoacanthocephala.- J. Parasit. **59**(5): 829 - 835.

SCHMIDT, G. D. & E. J. HUGGHINS (1973b): Acanthocephala of South American fishes. Part 2. Palaeacanthocephala.- J. Parasit. **59**(5): 836 - 838.

THATCHER, V. E. (1979): Uma nova espécie de *Gorytocephalus* NICKOL & THATCHER, 1971 (Acanthocephala: Neoechinorhynchidae) do acari bodó (Pisces: Loricariidae) da Amazônia, Brasil.- Acta Amazônica **9**(1): 199 - 202.

THATCHER, V. E. (1980): *Rhadinorhynchus plagioscionis* n. sp. (Acanthocephala: Rhadinorhynchidae) da pescada (*Plagioscion squamosissimus*) da Amazônia brasileira.- Acta Amazônica **10**(4): 835 - 839.

THATCHER, V. E. (1981): *Neoechinorhynchus pterodoridis* n. sp. (Acanthocephala: Neoechinorhynchidae) do bacu liso (*Pterodoras granulosus*) da Amazônia brasileira.- Acta Amazônica **11**(3): 445 - 448.

THATCHER, V. E. & B. B. NICKOL (1972): Some acanthocephalans from Panama and Colombia.- Proc. Helm. Soc. Wash. **39**(2): 245 - 248.

VAN CLEAVE, H. J. (1920): Two new genera and species of acanthocephalous worms from Venezuela fishes.- Proc. U. S. Nat. Mus. **58:** 455 - 466.

YAMAGUTI, S. (1963): Systema Helminthum. Vol. V. Acanthocephala.- Intersci. Publ. N. Y.: 423 pp.

Copepoda

BOEGER, W. A. & V. E. THATCHER (1988): *Rhinergasilus piranhus* gen. et sp. n. (Copepoda, Poecilostomatoida, Ergasilidae) from the nasal cavities of piranha cajú, *Serrasalmus nattereri*, in the Central Amazon.- Proc. Helm. Soc. Wash. **55**(1): 87 - 90.

BRIAN, A. (1924): Descrizione di un nuovo e curioso copepode lerneideo parasita de *Salminus brevidens* raccolto dal Prof. Filippo Silvestri nell'America del Sud.- Boll. Lab. Zool. Gen. e Agrar. R. Scuola Super. Agric. Portici **18:** 32 - 36.

CRESSEY, R. F. & B. B. COLLETTE (1970): Copepods and needlefishes: a study in host-parasite relationships.- Fish. Bull. **68:** 347 - 432.

KABATA, Z. (1979): Parasitic Copepoda of British Fishes.- The Ray Society (London): 468 pp. + figs. 1 - 2, 031.

MALTA, J. C. O. & A. VARELLA (1986): *Ergasilus holobryconis* sp. n. crustáceo parasita de *Holobrycon pesu* (MÜLLER & TROSCHELL), um peixe da Amazônia brasileira (Copepoda: Poecilostomatoida: Ergasilidae).- Amazoniana **10**(1): 41 - 48.

MONTU, M. (1980): Parasite copepods of Southern Brazil fishes, I. *Ergasilus euripedesi* n. sp. (Copepoda, Cyclopidea).- Iheringia, ser. Zool. (Porto Alegre, Brazil) **56:** 53 - 62.

PAIVA CARVALHO, J. (1955): *Ergasilus xenomelanirisi* n. sp. parasito de peixe-rei – *Xenomelaniris brasiliensis* (QUOY & GAIMARD).- Bol. Inst. Oceanogr. (Brazil) **6**(1-2): 215 - 224.

PAIVA CARVALHO, J. (1962): *Ergasilus cyanopictus* sp. nov., parasito de tainha – *Mugil cephalus* (L.) (Crustacea, Copepoda – Pisces, Mugiloidei).- Arq. Mus. Nac. Rio de Janeiro **52:** 31 - 36.

ROBERTS, L. S. (1965): *Ergasilus tenax* sp. n. (Copepoda, Cyclopoida) from the white crappie, *Pomoxis annularis* RAFINESQUE.- J. Parasit. **51**(6): 987 - 989.

ROBERTS, L. S. (1970): *Ergasilus* (Copepoda: Cyclopoida): Revision and key to species in North America.- Trans. Am. Mic. Soc. **89**(1): 134 - 161.

THATCHER, V. E. (1981a): Os crustáceos parasitos de peixes da Amazônia brasileira, 1. *Ergasilus bryconis* n. sp. (Copepoda: Cyclopidea) da matrinchã (*Brycon melanopterus* (COPE)).- Acta Amazônica **11:** 437 - 442.

THATCHER, V. E. (1981b): Os crustáceos parasitos de peixes da Amazônia brasileira, 2. *Ergasilus leporinidis* n. sp. (Copepoda: Cyclopoidea) das brânquias de *Leporinus fasciatus* (BLOCH).- Acta Amazônica **11:** 723 - 727.

THATCHER, V. E. (1984a): The parasitic crustaceans of fishes from the Brazilian Amazon, 7. *Acusicola tucunarense* n. sp. (Copepoda: Cyclopidea) from *Cichla ocellaris*, with an emendation of the genus and the proposal of Acusicolinae subfam. nov.- Rev. Brasil. Biol. **44**(2): 181 - 189.

THATCHER, V. E. (1984b): *Ergasilus pitalicus* n. sp. (Copepoda: Poecilostomatoida: Ergasilidae) a gill parasite of a cichlid fish from the Pacific Coast of Colombia, South America.- J. Crust. Biol. **4**(3): 495 - 501.

THATCHER, V. E. (1986): The parasitic crustaceans of fishes from the Braszilian Amazon, 16. *Amazonicopeus elongatus* gen. et sp. nov. (Copepoda: Poecilostomatoida) with the proposal of Amazonicopeidae fam. nov. and remarks on its pathogenicity.- Amazoniana **10**(1): 49 - 56.

THATCHER, V. E. & W. A. BOEGER (1983a): Patologia de peixes da Amazônia brasileira, 3. Alterações histológicas en brânquias provocadas por *Ergasilus, Brasergasilus* e *Acusicola* (Crustacea: Cyclopoida: Ergasilidae).- Acta Amazônica **13**(2): 441 - 451.

THATCHER, V. E. & W. A. BOEGER (1983b): The parasitic crustaceans of fishes from the Brazilian Amazon, 4. *Ergasilus colomesus* sp. n. (Copepoda: Cyclopidea) from an ornamental fish (*Colomesus asellus*: Tetraodontidae) and aspects of its pathogenicity.- Trans. Am. Mic. Soc. **102:** 371 - 379.

THATCHER, V. E. & W. A. BOEGER (1983c): The parasitic crustaceans of fishes from the Brazilian Amazon, 5. *Brasergasilus* gen. nov. (Copepoda: Cyclopidea), a "three-legged" ergasilid with two new species and the proposal of Abergasilinae subfam. nov.- Acta Amazônica **13**(1): 195 - 214.

THATCHER, V. E. & W. A. BOEGER (1983d): The parasitic crustaceans of fishes from the Brazilian Amazon, 10. *Acusicola pellonidis* n. sp. (Copepoda: Cyclopidea) from *Pellona castelnaeana* (VALENCIENNES).- Amazoniana **8**(2): 273 - 279.

THATCHER, V. E. & W. A. BOEGER (1984a): The parasitic crustaceans of fishes from the Brazilian Amazon, 9. *Ergasilus callophysus* n. sp. (Copepoda: Cyclopoida) from *Callophysus macropterus* (LICHTENSTEIN).- Proc. Helm. Soc. Wash. **51:** 326 - 330.

THATCHER, V. E. & W. A. BOEGER (1984b): The parasitic crustaceans of fishes from the Brazilian Amazon, 13. *Gamidactylus jaraquensis* gen. et sp. nov. (Copepoda: Poecilostomatoida: Vaigamidae) from the nasal fossae of *Semaprochilodus insignis* (SCHOMBURGK).- Amazoniana **8**(3): 421 - 426.

THATCHER, V. E. & W. A. BOEGER (1984c): The parasitic crustaceans of fishes from the Brazilian Amazon, 6. *Brasergasilus oranus* n. sp. (Copepoda: Cyclopidea) from *Anodus elongatus* SPIX.- Rev. Brasil. Biol. **44**(4): 181 - 189.

THATCHER, V. E. & W. A. BOEGER (1984d): The parasitic crustaceans of fishes from the Brazilian Amazon, 15. *Gamispatulus schizodontis* gen. et sp. nov. (Copepoda: Poecilostomatoida: Vaigamidae) from *Schizodon fasciatus* AGASSIZ.- Amazoniana **9**(1): 119 - 126.

THATCHER, V. E. & W. A. BOEGER (1984e): The parasitic crustaceans of fishes from the Brazilian Amazon, 14. *Gamispinus diabolicus* gen. et sp. nov. (Copepoda: Poecilostomatoida: Vaigamidae) from the nasal fossae of *Ageneiosus brevifilis* VALENCIENNES.- Amazoniana **8**(4): 505 - 510.

THATCHER, V. E. & W. A. BOEGER (1985): The parasitic crustaceans of fishes from the Brazilian Amazon, 8. *Acusicola lycengraulidis* n. sp. (Copepoda: Cyclopidea) from *Lycengraulis grossidens* CUVIER.- Acta Amazônica **13**(5-6): 943 - 951.

THATCHER, V. E., BOEGER, W. A. & B. A. ROBERTSON (1984): The parasitic crustaceans of fishes from the Brazilian Amazon, 12. *Ergasilus hydrolycus* n. sp. (Copepoda: Poecilostomatoida) from *Hydrolycus scomberoides* (CUVIER).- Amazoniana **8**(3): 321 - 326.

THATCHER, V. E. & V. PAREDES (1985a): A parasitic copepod, *Perulernaea gamitanae* gen. et sp. nov. (Cyclopoida: Lernaeidae), from the nasal fossae of a Peruvian Amazon food fish.- Amazoniana **9**(2): 169 - 175.

THATCHER, V. E. & V. PAREDES (1985b): A parasitic copepod, *Amplexibranchius bryconis* gen. et sp. nov. (Ergasilidae: Acusicolinae), from an Amazonian fish and remarks on the importance of leg morphology in this subfamily.- Amazoniana **9**(2): 205 - 214.

THATCHER, V. E. & B. A. ROBERTSON (1982): The parasitic crustaceans of fishes from the Brazilian Amazon, 3. *Ergasilus jaraquensis* n. sp. (Copepoda: Cyclopoidea) from the gills of *Semaprochilodus insignis* (SCHOMBURGK).- Rev. Brasil. Biol. **42:** 503 - 513.

THATCHER, V. E. & B. A. ROBERTSON (1984): The parasitic crustaceans of fishes from the Brazilian Amazon, 11. Vaigamidae fam. nov. (Copepoda: Poecilostomatoida) with males and females of *Vaigamus retrobarbatus* gen. et sp. nov. and *V. spinicephalus* sp. nov. from plankton.- Can. J. Zool. **62:** 716 - 729.

VARELLA, A. M. (1985): O ciclo biológico de *Ergasilus bryconis* THATCHER, 1981 (Crustacea: Poecilostomatoida, Ergasilidae) parasita das brânquias do matrinxã, *Brycon erythropterum* (COPE, 1872) e aspectos de sua ecologia.- M. Sc. thesis, INPA/FUA, Manaus, Amazonas, Brazil: 100 pp.

WILSON, C. B. (1911): North American parasitic copepods belonging to the family Ergasilidae.- Proc. U. S. Nat. Mus. **39:** 263 - 400.

YAMAGUTI, S. (1963): Parasitic Copepoda and Branchiura of Fishes.- Intersci. Publ. N. Y.: 1,104 pp.

Branchiura

BARZANTI, M. J. (1976): Algunos crustáceos branchiuros de los peces de ríos litoraleños.- Mus. Entre Ríos Cienc. Nat. y Antropol. ser. n. Zool. **1:** 5 - 31.

BOUVIER, E. L. (1897): Observation sur les argulidés du genre *Gyropeltis rêcueillis* par M. Geay au Vénézuela.- Bull. Mus. Hist. Nat. Paris **3**(1): 13 - 19, figs. 1 - 7.

BOUVIER, E. L. (1899a): Sur les argulidés du genre *Gyropeltis récueillis* récemment par M. Geay dans la Guyane.- Bull. Mus. Hist. Nat. Paris **5**(1): 39 - 41.

BOUVIER, E. L. (1899b): Les crustacés parasites du genre *Dolops* AUDOUIN.- Bull. Soc. Philomat. Paris **10** (ser. 8): 53 - 81; **1** (ser 9): 12 - 40.

BOUVIER, E. L. (1910): Un argulidé nouveau de l'Argentina.- Bull. Mus. Hist. Nat. Paris **2:** 92 - 95.

BOUVIER, G. (1953): De quelques crustacés parasites des poissons d'eau douce de Suisse et du Brésil.- Bull. Soc. Vaudoise Sci. Nat. **65**(283): 423 - 427, figs. A - F.

BREHM, V. & R. THOMSEN (1936): Brasilianische Phyllopoden und Arguliden gesammelt von Herrn Dr. O. Schubart.- Zool. Anz. **116:** 211 - 218, figs. 1 - 9.

BRIAN, A. (1946): Los argúlidos del Museo Argentino de Ciencias Naturales (Crustacea, Branchiura).- An. Mus. Argent. (Buenos Aires) **42:** 353 - 370.

CALMAN, W. T. (1912): On *Dipteropeltis* a new genus of the crustacean Order Branchiura.- Proc. Zool. Soc. London **4:** 763 - 766.

CUNNINGHAM, W. A. (1931): Reports of an expedition to Brasil and Paraguay in 1926 - 1927, supported by the Trustees of the Percy Sladen Memorial Fund and the Executive Commitee of the Carnegie Trust of Scotland. Argulidae.- J. Linn. Soc. London **37:** 259 - 265.

FONSECA, T. P. (1939): *Argulus vierai* n. sp., parásito de *Cnesterodon decemmaculatus* (JENYNS).- An. Mus. Montevideo **4:** 1 - 6.

HUGGHINS, E. J. (1970): Argulids (Crustacea: Branchiura) from Ecuador and Bolivia.- J. Parasit. **56** (5): 1,003.

LAHILLE, F. (1926): Nota sobre unos parásitos de los bagres, dorados y surubies.- Rev. Centro Estud. Agron. Vet. Univ. Buenos Aires **127:** 3 - 9, pls. 1 - 2.

LEMOS DE CASTRO, A. (1949): Contribuição ao conhecimento dos crustáceos argulídeos do Brasil (Branchiura, Argulidae), com descrição de uma espécie nova.- Bol. Mus. Nac. Rio de Janeiro, n. s. Zool. **93:** 1 - 7, figs. 1 - 26.

LEMOS DE CASTRO, A. (1950): Contribuição ao conhecimento dos crustáceos argulídeos do Brasil. II. Descrição de duas espécies novas.- An. Acad. Brasil. Cienc. **22**(2): 245 - 252, figs. 1 - 20.

LEMOS DE CASTRO, A. (1951): Descrição do alótipo macho de *Argulus multicolor* STEKHOVEN, 1937 (Branchiura, Argulidae).- Arq. Mus. Nac. Rio de Janeiro **42:** 159 - 166, pls. I - II.

MALTA, J. C. O. (1981): Os crustáceos branquiuros e suas interrelações com os peixes do Lago Janauacá, Amazonas, Brasil (Crustacea, Argulidae).- Master's thesis, INPA/Univ. Amazonas: 88 pp.

MALTA, J. C. O. (1982a): Os argulídeos (Crustacea, Branchiura) da Amazônia brasileira. Aspectos da ecologia de *Dolops discoidalis* BOUVIER, 1899, e *Dolops bidentata* BOUVIER, 1899.- Acta Amazônica **12**(3): 521 - 528.

MALTA, J. C. O. (1982b): Os argulídeos (Crustacea, Branchiura) da Amazônia brasileira. 2. Aspectos da ecologia de *Dolops geayi* BOUVIER, 1897, e *Argulus juparanaensis* CASTRO, 1950.- Acta Amazônica **12**(4): 701 - 705.

MALTA, J. C. O. (1983): Os argulídeos (Crustacea, Branchiura) da Amazônia brasileira. 4. Aspectos da ecologia de *Argulus multicolor* STEKHOVEN, 1937, e *Argulus pestifer* RINGUELET, 1948.- Acta Amazônica **13**(3-4): 489 - 495.

MALTA, J. C. O. & A. VARELLA (1983): Os argulídeos (Crustacea, Branchiura) da Amazônia brasileira. 3. Aspectos da ecologia de *Dolops striata* BOUVIER, 1899, e *Dolops carvalhoi* CASTRO, 1949.- Acta Amazônica **13**(2): 299 - 306.

MARTINEZ, R. (1952): *Argulus chilensis* nov. sp.- Invest. Zool. Chilenas **1**(7): 4 - 9, figs. 1 - 5.

MELLO LEITÃO, C. F. (1913): *Moreirella* nome novo para *Talaus* MOREIRA – *Dipteropeltis* CALMAN.- A Lavoura (Rio de Janeiro) **17:** 11 - 12.

MOREIRA, C. (1912): Crustacés du Brésil.- Mem. Soc. Zool. France **25:** 145 - 154, pls. III - VI.

MOREIRA, C. (1915): Les antennes de *Dipteropeltis hirundo* CALMAN (*Talaus riberoi* MOREIRA) (Crustacea, Argulidae).- Bull. Soc. Entom. France **25**(3-4): 120 - 122, 2 figs.

PAIVA CARVALHO, J. (1939): Sôbre dois parasitos do gênero *Dolops encontrados* em peixes d'água doce.- Rev. Industr. Animal (ser. 1) **2**(4): 109 - 116, figs. 1 - 6.

PAIVA CARVALHO, J. (1941): Sôbre *Dipteropeltis hirundo* CALMAN, crustáceo (Branchiura) parasito de peixes d'água doce.- Bol. Fac. Filos. Cienc. Univ. São Paulo **22**(5): 265 - 275.

PAIVA CARVALHO, J. (1947): Sôbre alguns ectoparasitos de peixes (Argulídeos).- Criação e Veterinária **2**(6): 155 - 156.

RINGUELET, R. (1941): Sôbre algunos crustáceos argúlidos argentinos.- Physis **19**(51): 112.

RINGUELET, R. (1942): Sobre dos espécies de argulidos (Crustacea, Branchiura) en las colecciones del Museu de Entre Ríos.- Mem. Mus. Entre Ríos **16:** 3 - 14.

RINGUELET, R. (1943): Revisión de los argúlidos argentinos (Crustacea, Branchiura), con el catálogo de las especies neotropicales.- Rev. Mus. La Plata (n. s.), Zool. **3**(19): 43 - 99, pls. 1 - 13.

RINGUELET, R. (1948): Argúlidos del Museo de La Plata.- Rev. Mus. La Plata (n. s.), Zool. **5:** 231 - 296, pls. 1 - 4.

SCHUURMANS STEKHOVEN, J. H., Jr. (1951): Investigaciones sobre argúlidos argentinos.- Acta Zool. Lilloana **12:** 479 - 494.

SILVA, N. M. M. (1978): Uma nova espécie de crustáceo argulídeo do Rio Grande do Sul, Brasil (Branchiura, Argulidae).- Iheringia, sér. Zool. **52:** 3 - 29.

THOMSEN, R. (1925): *Argulus violaceus* nov. sp. cangrejo parásito del bagre.- Physis **8:** 185 - 198.

THOMSEN, R. (1942): Notas críticas de dos argúlidos (Branchiura) del Brasil.- An. Acad. Brasil. Cienc. **14:** 37 - 45.

WEIBEZAHN, F. A. & T. COBO (1964): Seis argúlidos (Crustacea, Branchiura) parásitos de peces dulceacuícolas en Venezuela, con descripción de una nueva especie del genero *Argulus*.- Acta Biol. Venez. **4**(2): 119 - 143, pls. I - XV.

WILSON, C. B. (1944): Parasitic copepods in the United States National Museum.- Proc. U. S. Nat. Mus. **94**(3): 529 - 582, pls. 20 - 34.

YAMAGUTI, S. (1963): Parasitic Copepods and Branchiura of Fishes.- Intersci. Publ. N. Y.: 1,104 pp., 333 pls.

Isopoda

BOUVIER, G. (1953): De quelques crustacés parasites des poissons d'eau douce de Suisse et du Brasil.- Bull. Soc. Vaudoise Sci. Nat. **65**(283): 423 - 427, figs. A - F.

BOWMAN, T. E. (1986): *Paracymothoa tholoceps*, a freshwater parasitic isopod from Southern Venezuela (Flabellifera: Cymothoidae).- Proc. Biol. Soc. Wash. **99**(4): 753 - 756.

BOWMAN, T. E. & C. DÍAZ-UNGRÍA (1957): Isópodos quimotoideos de peces de las águas venezolanas.- Mem. Soc. Cien. Nat. La Salle (Caracas) **17**(47): 112 - 124, figs. 1 - 4.

BRUSCA, R. C. (1978): Studies on the cymothoid fish symbionts of the Eastern Pacific (Crustacea: Isopoda: Cymothoidae) II. Systematics and biology of *Lironeca vulgaris* STIMSON 1857.- Occas. Pap. Allan Hancock Found. New Ser. **2:** 1 - 19.

BRUSCA, R. C. (1981): A monograph on the Isopoda Cymothoidae (Crustacea) of the Eastern Pacific.- Zool. J. Linn. Soc. London **73:** 117 - 199.

BRUSCA, R. C. & M. R. GILLIGAN (1983): Tongue replacement in a marine fish (*Lutjanus guttatus*) by a parasitic isopod (Crustacea: Isopoda).- Copeia **3:** 813 - 816.

CORDERO, E. H. (1937): *Nerocila fluviatilis* y otros parásitos de las familias Cymothoidae y Bopyridae del Uruguay y del Brasil.- An. Mus. Hist. Nat. Montevideo **24**(12): 1 - 11, pl. I.

GIAMBIAGI DE CALABRESE, D. (1922): Cuatro nuevos isópodos de la Argentina.- Physis **5**(20): 230 - 244, pls. I - IV.

GIAMBIAGI DE CALABRESE, D. (1933): Descripción complementaria de un isópodo de agua dulce *Braga fluviatilis* RICHARDSON.- An. Mus. Nac. Hist. Nat. (Buenos Aires) **37:** 511 - 515.

HUIZINGA, H. W. (1972): Pathobiology of *Artystone trysibia* SCHIÖDTE (Isopoda: Cymothoidae), an endoparasitic isopod of South American freshwater fishes.- J. Wildl. Dis. **8:** 225 - 232.

LEIGH-SHARPE, W. H. (1937): *Badroulboudour splendida* n. g. et sp., a new parasitic isopod from Ecuador.- Parasit. **29:** 391 - 394.

LEMOS DE CASTRO, A. (1955): "*Paracymothoa astyanaxi*" g. n. esp. n. Isopode parasita de peixe de água doce (Isopoda, Cymothoidae).- Rev. Brasil. Biol. **15**(4): 411 - 414.

LEMOS DE CASTRO, A. (1959): Sôbre as espécies sul-americanas do gênero *Braga* SCHIÖDTE & MEINERT, 1881 (Isopoda, Cymothoidae).- Arch. Mus. Nac. (Rio de Janeiro) **49:** 69 - 77.

LEMOS DE CASTRO, A. & J. LOYOLA E SILVA (1985): 33. Isopoda. In: SCHADEN, R. (Organizer): Manual de Identificação de Invertebrados Límnicos do Brasil.- CNPq, Brasilia: 10 pp.

LEMOS DE CASTRO, A. & J. P. MACHADO FILHO (1946): "*Artystone trysibia*" SCHIÖDTE, um crustáceo parasita de peixe d'água doce de Brasil, com descrição do alótipo macho (Isopoda, Cymothoidae).- Rev. Brasil. Biol. **6**(3): 407 - 413.

MARTENS, E. VON (1869): Südbrasilianische Süss- und Brackwasser-Crustaceen nach den Sammlungen des Dr. Reinh. Hensel.- Arch. Naturgesch. **35**(1): 1 - 37, pls. I - II.

MONOD, T. (1931): Sur un *Braga* do Paraguay.- Ann. Parasit. Hum. Comp. **9:** 363 - 365.

PAIVA CARVALHO, J. (1939): Sôbre um caso curioso de ectoparasitismo.- Rev. Industr. Animais (São Paulo) (n. s.) **2**(3): 41 - 44.

RICHARDSON, H. (1911): Description d'un nouvel isopode du genre *Braga* provenant d'une riviere de l'Amerique du Sul.- Bull. Mus. Natl. Hist. Nat. (Paris) **17:** 94 - 96.

RINGUELET, R. (1947): Anotaciones sobre copépodos y isópodos parásitos de peces.- Notas Mus. La Plata Zool. (Argentina) **12**(98): 93 - 107, pls. I - II.

ROMESTAND, B. & J. P. TRILLES (1977): Dégénérescence de la langue des bogues ((*Boobs boops* L., 1758) (Téléostéens, Sparidae)) parasitées par *Meinertia oestroides* (RISSO, 1826) (Isopoda, Flabellifera, Cymothoidae).- Z. Parasitenk. **54:** 47 - 53.

ROMESTAND, B. & J. P. TRILLES (1979): Influence des cymothoadiens *Meinertia oestroides, Meinertia parallela* et *Anilocra physodes* (Crustacés, Isopodes; parasites de poissons) sur la croissance des poissons hôtes *Boops boops* et *Pagellus erythrinus* (sparidés).- Z. Parasitenk. **59:** 195 - 202.

SCHIÖDTE, J. C. (1866): Krebsdyrenes Sugemund.- Naturhist. Tidsskr. ser. 3, **4:** 169 - 206, pls. X - XI.

SCHIÖDTE, J. C. & E. MEINERT (1881): Symbolae ad Monographiam Cymothoarum Crustaceorum Isopodus Familiae. IV. Cymothoidae.- Naturhist. Tidsskr. ser. 3, **14:** 221 - 454, pls. VI - XVII & XXIV - XXXVI.

SCHOUTEN, G. B. (1932): Isópodo del género *Braga*.- Rev. Soc. Cient. Paraguay **3:** 105 - 106.

STADLER, T. (1972): *Braga bachmanni*, nuevo ectoparásito de *Ancistrus cirrosus* (Crustacea, Cymothoidae en Piece, Loricariidae).- Neotropica **18**(57): 141 - 145.

SZIDAT, L. (1948): *Riggia paranensis* n. g., n. sp. un isópodo parásito de la cavidad del cuerpo de "*Curimata platana*" GÜNTHER, del Río Paraná (y descripción del huesped por el Prof. Alberto Nani).- Rev. Inst. Nac. Mus. Argent. Cienc. Nat. Bernadino Rivadavia, Cienc. Zool. **1**(2): 47 - 65.

SZIDAT, L. (1965): Sobre la evolución del dimorfismo sexual secundario en isópodos parásitos de la familia Cymothoidae (Crustacea, Isopoda).- An. Seg. Congr. Lat. Amer. Zool. (1962) **2:** 83 - 87.

SZIDAT, L. & O. SCHUBART (1960): Neue und seltene parasitische Süsswasser-Asseln der Familie Cymothoidae aus dem Río Mogi Guassu, Brasilien (Isopoda).- An. Acad. Brasil. Cien. **32**(1): 107 - 124.

TABERNER, R. (1976): Un nuevo isópodo de la familia Cymothoidae, *Paracymothoa parva* sp. nov. parásito de *Hyphessobrycon callistus* (COULENGER, 1860) EIGENMANN, 1910 (Pisces, Characidae) .- Physis, B **35**(91): 163 - 169.
TABERNER, R. (1977): *Nebula maculatus* gen. nov. sp. nov. (Crustacea, Isopoda, Cymothoidae), ectoparásito de *Metynnis maculatus* (KNER, 1860) BERG, 1897 (Pisces, Characidae).- Physis, B **35**(92): 141 - 146.
TABERNER, R. (1979): Aclaración sobre el nombre *Nebula maculatus* TABERNER, 1977 (Crustacea, Isopoda, Cymothoidae).- Physis, B **38**(94): 55.
THATCHER, V. E. (1988): *Asotana magnifica* n. sp. (Isopoda, Cymothoidae) an unusual parasite (commensal?) of the buccal cavities of piranhas (*Serrasalmus* sp.) from Roraima, Brazil.- Amazoniana **10**(3): 239 - 248.
THATCHER, V. E. & M. L. CARVALHO (1988): *Artystone minima* n. sp. (Isopoda, Cymothoidae) a body cavity parasite of the pencil fish (*Nannostomus beckfordi* GÜNTHER) from the Brazilian Amazon.- Amazoniana **10**(3): 255 - 265.
TRILLES, J. P. (1973): Notes documentaires sur les isopodes cymothodiens parasites de poissons d'eau douce de l'Amérique du Sud.- Bull. Mus. Natl. Hist. Nat. Paris, ser. 3 Zool. **88:** 239 - 272, pls. I - II.
VAN NAME, W. G. (1925): The isopods of Kartabo, Bartica District, British Guiana.- Zoologica **6**(5): 461 - 503, pls. A - B.
WEIBEZAHN, F. H. & M. V. RAMÍREZ (1957): Mortandad de peces de água dulce causada por un crustáceo parásito, *Artystone trysibia* SCHIÖDTE & MEINERT, 1866 (Isopoda, Cymothoidae).- Bol. Soc. Venezol. Cienc. Nat. **18**(89): 153 - 156.

Hirudinea

CABALLERO y C., E. (1940): Sobre la presencia de la *Placobdella rugosa* (Hirudinea: Glossiphoniidae) en las águas del Lago de Xochimilco. XIII.- An. Inst. Biol. Mexico **12**(1/2): 255 - 260.
CABALLERO y C., E. (1941): Hirudineos de México. XVI. Nuevos huespedes y localidades para algunas sanguijuelas ya conocidas y descripción de una nueva especie.- An. Inst. Biol. Mexico **12**(2): 752 - 753.
CABALLERO y C., E. (1960): Hirudineos de México. XXII. Taxa y nomenclatura de la clase Hirudinea hasta géneros (nueva edición).- An. Inst. Biol. Mexico **30:** 227 - 242.
MAÑE-GARZÓN, F. & R. MONTERO (1977): *Myzobdella uruguayensis* n. sp. (Hirudinea, Piscicolidae) parasita de las branquias del bagre amarilla, *Rhambdia sapo* (VALL.).- Rev. Biol. Uruguay **5:** 59 - 65.
RINGUELET, R. A. (1944): Sinopsis sistemática y zoogeográfica de los hirudíneos de la Argentina, Brasil, Chile, Paraguay y Uruguay.- Rev. Mus. La Plata, n. s. 3 (Zool.) **3**(22): 163 - 232.
RINGUELET, R. A. (1947): Notas sobre hirudíneos neotropicales III. *Theromyzon propinquus* nov. sp., de la Argentina.- Notas Mus. La Plata **12**(100): 217 - 222.
RINGUELET, R. A. (1976): Clave para las familias y géneros de sanguijuelas (Hirudinea) de águas dulces y terrestres de Mesoamérica y Sudamérica.- Limnobios **1**(1): 9 - 19.

Pentastomida

THATCHER, V. E. (1981): Patologia de peixes da Amazônia brasileira, 1. Aspectos gerais.- Acta Amazônica **11**(1): 125 - 140.
TRAVASSOS, L., ARTIGAS, P. & C. PEREIRA (1928): Fauna helminthológica dos peixes de água doce do Brasil.- Arch. Inst. Biol. São Paulo, Brasil **1:** 5 - 68 + 155 figs.

13. Addendum: Host-parasite list

In the following list, the scientific names of host fish are listed alphabetically without regard to phylogeny. Below each fish name, the parasites reported from that host are listed. *Trypanosoma* (Protozoa) and *Sebekia* (Pentastomida) are omitted here because their hosts are listed in Chapters 2 and 11, respectively.

- *Acanthicus hystrix*
  - Monogenoidea
    - *Trinigyrus acuminatus*

- *Acestrorhamphus* (= *Oligosarcus*) *macrolepis*
  - Nematoda
    - *Spirocamallanus hilarii*
    - *Contracaecum* sp. (larvae)

- *Acestrorhamphus* sp. (= *Oligosarcus* sp.)
  - Myxozoa
    - *Myxidium gurgeli*
  - Ciliophora
    - *Nyctotherus piscicola*
  - Trematoda
    - *Halipegus genarchella*
    - *parvus*
    - *Prosorhynchus costai*
    - *Prosthenhystera obesa*
  - Nematoda
    - *Capillaria piscicola*
    - *Contracaecum* sp. (larvae)
    - *Eustrongylides* sp. (larvae)

- *Acestrorhynchus falcatus*
  - Trematoda
    - *Bellumcorpus major*
  - Acanthocephala
    - *Palliolisentis polyonca*

- *Achirus lineatus*
  - Acanthocephala
    - *Neoechinorhynchus variabilis*

- *Achirus mazatlanus*
  - Acanthocephala
    - *Neoechinorhynchus roseum*

- *Aequidens maroni*
  - Monogenoidea
    - *Sciadicleithrum aequidens*
    - *cavanaughi*

- *Aequidens pulcher*
  - Trematoda
    - *Crassicutis chuscoi*
  - Acanthocephala
    - *Pandosentis iracundus*
  - Branchiura
    - *Dolops geayi*

- *Ageneiosus brevifilis*
  - Cestoda
    - *Anthobothrium mandube*
    - *Endorchis mandube*
    - *Gibsoniela mandube*
  - Copepoda
    - *Gamispinus diabolicus*
  - Isopoda
    - *Excorallana* sp.

- *Ancistrus cirrhosus*
  - Nematoda
    - *Rhaphidascaris* sp. (larvae)

- *Ancistrus* sp.
  - Nematoda
    - *Guyanema ancistri*

- *Anodus elongatus*
  - Copepoda
    - *Brasergasilus anodus*
    - *oranus*

- *Arapaima gigas*
  - Monogenoidea
    - *Dawestrema cycloancistrioides*
    - *cycloancistrium*
    - *punctata*
  - Trematoda
    - *Caballerotrema arapaimense*
    - *brasiliense*
  - Cestodaria
    - *Nesolecithus janicki*
    - *Schizochoerus liguloideus*

- Nematoda
  - *Camallanus tridentatus*
  - *Goezia spinulosa*
  - *Philometra senticosa*
  - *Porrocaecum draschei*
- Acanthocephala
  - *Polyacanthorhynchus macrorhynchus*
    - *rhopalorhynchus*
- Copepoda
  - *Ergasilus* sp.
- Branchiura
  - *Argulus* sp.
  - *Dolops discoidalis*

Arius comersonii
- Monogenoidea
  - *Fridericianella ovicola*

Astronotus ocellatus
- Monogenoidea
  - *Gussevia asota*
    - *astronoti*
    - *rogersi*
- Nematoda
  - *Goezia spinulosa*
  - *Spirocamallanus inopinatus*
- Branchiura
  - *Argulus* sp.
  - *Dolops bidentata*
    - *discoidalis*
    - *geayi*

Astyanax bimaculatus
- Monogenoidea
  - *Cycloplectanum americanum*
  - *Urocleidoides costaricensis*
    - *heteroancistrium*
    - *trinidadensis*
- Trematoda
  - *Magnivitellinum simplex*
- Nematoda
  - *Rhabdochona australis*
  - *Spirocamallanus cearensis*
    - *hilarii*
    - *inopinatus*
- Acanthocephala
  - *Quadrigyrus torquatus*
- Branchiura
  - *Argulus juparanaensis*
- Isopoda
  - *Paracymothoa astyanactis*

Astyanax fasciatus
- Myxozoa
  - *Henneguya wenyoni*
- Monogenoidea
  - *Anacanthocotyle anacanthocotyle*
  - *Gyrodactylus neotropicalis*
  - *Jainus hexops*
  - *Urocleidoides costaricensis*
    - *kabatai*
    - *strombicirrus*
    - *trinidadensis*
- Trematoda
  - *Antorchis lintoni*
  - *Chalcinotrema ruedasueltensis*
  - *Dadaytremoides grandistomis*
  - *Halipegus dubius*
    - *tropicus*
  - *Prosorhynchus costai*
  - *Prosthenhystera obesa*
  - *Saccocoelioides octavus*
- Nematoda
  - *Capillaria sentinosa*
  - *Paraseuratum albidum*
  - *Rhabdochona fasciata*
  - *Spirocamallanus hilarii*
    - *inopinatus*
- Acanthocephala
  - *Quadrigyrus torquatus*

Astyanax sp.
- Trematoda
  - *Phyllodistomoides duncani*
- Nematoda
  - *Capillaria sentinosa*
  - *Rhabdochona fasciata*
  - *Spirocamallanus wrighti*

Atractosteus tristoechus
- Cestoda
  - *Proteocephalus manjuariphilus*

Barbus sp.
- Nematoda
  - *Rhabdochona acuminata*

Basilichthys microlepidotus
- Cestoda
  - *Proteocephalus macdonaghi*

Brachyplatystoma filamentosum
- Cestoda
  - *Endorchis piraeeba*
  - *Nominoscolex piraeeba*

Brachyplatystoma rousseauxii
- Cestoda
  - *Amphoteromorphus peniculus*
  - *Nominoscolex dorad*
    - *sudobim*

Brachyplatystoma sp.
- Isopoda
  - *Lironeca symmetrica*
  - *Telotha henselii*

Brachyplatystoma vaillanti
- Cestoda
  - *Anabothrium piramutab*
  - *Monticellia piramutab*

Brycon brevicaudata
- Nematoda
  - *Spirocamallanus inopinatus*

Brycon cephalus
- Copepoda
  - *Amplexibranchius bryconis*

Brycon falcatus
- Nematoda
  - *Rhabdochona acuminata*

Brycon hilarii
- Nematoda
  - *Spirocamallanus inopinatus*
- Acanthocephala
  - *Echinorhynchus briconi*

Brycon lundi
- Trematoda
  - *Dendrorchis neivai*
- Nematoda
  - *Amplicaecum* sp. (larvae)

Brycon melanopterus (= *erythropterus*)
- Monogenoidea
  - *Anacanthorus brevis*
    - *elegans*
    - *kruidenieri*
    - *spiralocirrus*
  - *Jainus amazonensis*
  - *Tereancistrum kerri*
    - *ornatus*
  - *Trinibaculus braszilensis*
- Nematoda
  - *Spirocamallanus inopinatus*
- Copepoda
  - *Ergasilus bryconis*

Callophysus macropterus
- Copepoda
  - *Ergasilus callophysus*

Carapus fasciatus
- Myxozoa
  - *Myxidium fonsecai*

Carassius auratus
- Monogenoidea
  - *Gyrodactylus elegans*
- Branchiura
  - *Argulus ernsti*

Carnegiella strigata
- Isopoda
  - *Lironeca symmetrica*

Centropomus nigriscens
- Monogenoidea
  - *Mexicotrema bychowskyi*

Cephalosilurus (= *Pseudopimelodus*) *zungaro*
- Monogenoidea
  - *Phanerothecium caballeroi*
  - *Urocleidoides mamaevi*

Cetopsis caecutiens
- Cestoda
  - *Monticellia siluri*

Chaetobranchus semifasciatus
- Trematoda
  - *Ascocotyle* sp. (metacercariae)
- Cestoda
  - Proteocephalidae (plerocercoids)

Chaetostomus leucomelas
- Trematoda
  - *Dadaytremoides grandistomis*

Chalceus macrolepidotus
- Monogenoidea
  - *Jainus jainus*

Chalcinus nematurus
- Myxozoa
  - *Myxidium cruzi*

Characidae
- Nematoda
  - *Neocucullanus neocucullanus*

Characidium caucanum
Monogenoidea
Urocleidoides anops

Chilodus punctatus
Acanthocephala
Octospiniferoides australis

Chromis sp.
Branchiura
Argulus chromidis

Cichla monoculus
Cestoda
Proteocephalus macrophallus

Cichla ocellaris
Monogenoidea
Gussevia arilla
longihaptor
tucunarense
undulata
Sciadicleithrum uncinatum
ergensi
umbilicum
Cestoda
Proteocephalus macrophallus
microscopicus
Sciadocephalus megalodiscus
Nematoda
Eustrongylides sp. (larvae)
Copepoda
Acusicola tucunarense
Ergasilus sp.
Branchiura
Argulus sp.
Isopoda
Braga cichlae
Lironeca symmetrica
Nerocila armata

Cichla sp.
Isopoda
Braga cichlae

Cichla temensis
Branchiura
Argulus multicolor
Isopoda
Braga cichlae

Cichlasoma aureum
Acanthocephala
Neoechinorhynchus golvani

Cichlasoma bimaculatum
Monogenoidea
Gussevia alii
cichlosomatis
dobosi
Trinidactylus cichlasomatis

Cichlasoma facetum
Nematoda
Procamallanus peraccuratus

Cichlasoma fenestratum
Ciliophora
Nyctotherus dilleri

Cichlasoma mayorum
Trematoda
Crassicutis cichlasomae

Cichlasoma severum (= *Heros severus*)
Monogenoidea
Gussevia alioides
dispar
disparoides

Cichlasoma tetracanthus
Branchiura
Argulus cubensis

Cichlasoma sp.
Trematoda
Crassicutis opisthoseminis
Copepoda
Ergasilus pitalicus

Cichlidae
Nematoda
Touzeta ecuadoris
Isopoda
Lironeca orinoco

Colomesus asellus
Copepoda
Ergasilus colomesus

Colossoma bidens (= *Piaractus brachypomus*)
Myxozoa
Myxobolus sp.
Ciliophora
Nyctotherus piscicola
Monogenoidea
Anacanthorus spathulatus

Trematoda
Dadaytrema oxycephala
Denticauda quadrangulata
Pseudocladorchis cylindricus
Pseudoparabaris parabaris
Travassosinia dilatata
Nematoda
Monhysterides iheringi
Rondonia rondoni
Spectatus spectatus
Acanthocephala
Echinorhynchus jucundum
Branchiura
Dolops bidentata
carvalhoi

Colossoma macropomum
Monogenoidea
Linguadactyloides brinkmanni
Nematoda
Chabaudinema americana
Cucullanus colossomi
Acanthocephala
Neoechinorhynchus buttnerae
Copepoda
Perulernaea gamitanae
Branchiura
Argulus multicolor
Argulus sp.
Dolops carvalhoi

Colossoma mitre (= *Piaractus mesopotamicus*)
Nematoda
Rondonia rondoni

Corydoras aeneus
Monogenoidea
Urocleidoides corydori
margolisi

Corydoras lepidata
Nematoda
Procamallanus peraccuratus

Corydoras paleatus
Monogenoidea
Paragyrodactyloides superbus
Nematoda
Spirocamallanus pintoi

Creatochanes affinis
Monogenoidea
Jainus robustus
Urocleidoides affinis

Crenicichla geayi
Trematoda
Crassicutis wallini
Acanthocephala
Pandosentis iracundus
Quadrigyrus torquatus
Branchiura
Dolops geayi

Crenicichla lacustris
Isopoda
Artystone trysibia

Crenicichla saxatilis
Isopoda
Nerocila armata

Crenicichla sp.
Branchiura
Dolops geayi

Curimata (= *Steindachnerina*) *argentea*
Monogenoidea
Curvianchoratus hexacleidus
Urocleidoides costaricensis
curimatae

Curimata (= *Psectrogaster*) *ciliata*
Branchiura
Argulus sp.

Curimata (= *Steindachnerina*) *elegans*
Trematoda
Zonocotyle bicaecata
Nematoda
Travnema travnema
Acanthocephala
Gorytocephalus spectabilis

Curimata (= *Cyphocharax*) *gilberti*
Monogenoidea
Androspira chascomusensis
triangula
Notodiplocerus singularis
Trematoda
Zonocotyle bicaecata
Zonocotyloides haroltravassosi
Nematoda
Cosmoxynema viannai
Cosmoxynemoides aguirrei
Travnema araujoi

- *Curimata* (= *Potamorhina*) *laticeps*
  - Branchiura
    - *Argulus* sp.
- *Curimata* (= *Cyphocharax*) *platana*
  - Isopoda
    - *Riggia paranensis*
- *Cynopotamus humeralis*
  - Trematoda
    - *Halipegus dubius*
  - Nematoda
    - *Spirocamallanus inopinatus*
  - Isopoda
    - *Braga cichlae*
    - *Philostomella cigarra*
- *Doras* (= *Platydoras*) *costatus*
  - Ciliophora
    - *Rynchodinium paradoxum*
  - Trematoda
    - *Pseudocladorchis ferrumequinum*
    - *Pseudodiplodiscus cornu*
- *Doras* (= *Lithodoras*) *dorsalis*
  - Trematoda
    - *Pseudocladorchis ferrumequinum*
    - *Pseudodiplodiscus cornu*
- *Eigenmannia virescens*
  - Monogenoidea
    - *Urocleidoides virescens*
- *Electrophorus electricus*
  - Trematoda
    - *Echinostoma annulatum*
- *Elipesurus spinicauda*
  - Cestoda
    - *Eutetrarhynchus araya*
    - *Rhinebothroides scorzai*
- Erythrinidae
  - Nematoda
    - *Spirocamallanus paraensis*
- *Farlowella amazona*
  - Monogenoidea
    - *Oogyrodactylus farlowellae*
- *Fitzroyia lineata*
  - Acanthocephala
    - *Wolffhugelia matercula*
- *Galaxias maculatus*
  - Myxozoa
    - *Myxobolus galaxii*
    - *magellanicus*
- *Gasterostomus* (= *Potamorhina*) *latior*
  - Branchiura
    - *Dolops* sp.
- *Geophagus brasiliensis*
  - Nematoda
    - *Cosmoxynemoides aguirrei*
    - *Procamallanus peraccuratus*
  - Acanthocephala
    - *Neoechinorhynchus paraguayensis*
  - Isopoda
    - *Artystone trysibia*
- *Geophagus* (= *Satanoperca*) *jurupari*
  - Branchiura
    - *Argulus multicolor*
- *Geophagus surinamensis*
  - Monogenoidea
    - *Sciadicleithrum geophagi*
- *Geophagus* sp.
  - Isopoda
    - *Telotha henselii*
- *Gephyrocharax valenciae*
  - Acanthocephala
    - *Quadrigyrus torquatus*
- *Glanidium* sp.
  - Cestoda
    - *Brayela karuatayi*
- *Gymnorhamphichthys hypostomus*
  - Trematoda
    - *Amazonadistoma negrensis*
- *Gymnotus carapo*
  - Monogenoidea
    - *Urocleidoides carapus*
    - *gymnotus*
- *Hemigrammus microstomus*
  - Monogenoidea
    - *Urocleidoides microstomus*

- *Hemiodus* (= *Hemiodopsis*) *semitaeniatus*
  - Monogenoidea
    - *Cleidodiscus microcirrus*
    - *Monocleithrium lavergneage*
- *Hemisorubim platyrhynchus*
  - Monogenoidea
    - *Vancleavius platyrhynchi*
- *Hemisorubim* sp.
  - Branchiura
    - *Dolops discoidalis*
- *Holobrycon pesu*
  - Copepoda
    - *Ergasilus holobryconis*
- *Hoplerythrinus unitaeniatus*
  - Nematoda
    - *Guyanema seriei*
    - *seriei paraguayensis*
    - *Spirocamallanus krameri*
  - Acanthocephala
    - *Quadrigyrus brasiliensis*
    - *nickoli*
  - Branchiura
    - *Dolops discoidalis*
- *Hoplias macrophthalmus*
  - Isopoda
    - *Paracymothoa tholoceps*
- *Hoplias malabaricus*
  - Monogenoidea
    - *Urocleidoides eremitus*
  - Nematoda
    - *Capillaria zederi*
    - *Guyanema baudi*
    - *Spirocamallanus hilarii*
    - *wrighti*
    - *Contracaecum* sp. (larvae)
    - *Eustrongylides* sp. (larvae)
  - Acanthocephala
    - *Grasilisentis variabilis*
    - *Neoechinorhynchus paraguayensis*
    - *Quadrigyrus brasiliensis*
    - *torquatus*
  - Hirudinea
    - *Myzobdella platense*
  - Copepoda
    - *Ergasilus iheringi*
  - Branchiura
    - *Argulus carteri*
    - *spinulosus*
    - *violaceus*
    - *Dolops discoidalis*
    - *geayi*
    - *reperta*
    - *striata*
  - Isopoda
    - *Braga patagonica*
    - *Telotha henselii*
- *Hydrolycus scomberoides*
  - Copepoda
    - *Ergasilus hydrolycus*
  - Branchiura
    - *Argulus multicolor*
- *Hyphessobrycon callistus*
  - Isopoda
    - *Paracymothoa parva*
- *Hyphessobrycon strictus*
  - Monogenoidea
    - *Urocleidoides strictus*
- *Hypophthalmus edentatus*
  - Nematoda
    - *Paracamallanus* sp.
- *Hypoptopoma thoracathum*
  - Monogenoidea
    - *Trinigyrus tentaculoides*
- *Hypostomus albopunctatus*
  - Nematoda
    - *Procamallanus petterae*
- *Hypostomus auroguttatus*
  - Acanthocephala
    - *Gracilisentis variabilis*
- *Hypostomus bolivianus*
  - Monogenoidea
    - *Unilatus anoculus*
- *Hypostomus carinatus*
  - Acanthocephala
    - *Gorytocephalus elongorchis*

- *Hypostomus commersonii*
  - Trematoda
    - *Gonocercella magnifica*
  - Nematoda
    - *Rhaphidascaris* sp. (larvae)
  - Branchiura
    - *Argulus violaceus*

- *Hypostomus lituratus*
  - Acanthocephala
    - *Gracilisentis variabilis*

- *Hypostomus melanopterus*
  - Acanthocephala
    - *Gracilisentis variabilis*

- *Hypostomus plecostomus*
  - Trematoda
    - *Eocreadium intermedium*
    - *Gonocercella magnifica*
    - *Megacoelium plecostomi*
  - Acanthocephala
    - *Gorytocephalus plecostomorum*
    - *Gracilisentis variabilis*

- *Hypostomus punctatus*
  - Trematoda
    - *Kalitrema kalitrema*

- *Hypostomus robinii*
  - Monogenoidea
    - *Trinigyrus hypostomatis*
    - *Unilatus unilatus*

- *Hypostomus* sp.
  - Monogenoidea
    - *Unilatus brittani*
  - Nematoda
    - *Sprentascaris hypostomi*
  - Isopoda
    - *Braga nasuta*

- *Iheringichthys labrosus*
  - Trematoda
    - *Crepidostomum platense*
    - *Sanguinicola coelomicola*
  - Isopoda
    - *Telotha silurii*

- *Lahilliela* (= *Schizodon*) *kneri*
  - Trematoda
    - *Paralecithobotrys brasiliensis*

- *Leiarius marmoratus*
  - Branchiura
    - *Dolops discoidalis*

- *Lepidosiren paradoxa*
  - Myxozoa
    - *Agarella gracilis*
  - Trematoda
    - *Kalipharynx piramboae*

- *Leporellus vittatus*
  - Isopoda
    - *Riggia brasiliensis*

- *Leporinodus vittatus*
  - Trematoda
    - *Saccocoelioides leporinodus*

- *Leporinus copelandi*
  - Trematoda
    - *Creptotrema lynchi*
  - Nematoda
    - *Cucullanus pinnai*
    - *Spirocamallanus inopinatus*
  - Isopoda
    - *Riggia brasiliensis*

- *Leporinus elongatus*
  - Trematoda
    - *Creptotrema creptotrema*
    - *Paralecithobotrys brasiliensis*

- *Leporinus fasciatus*
  - Monogenoidea
    - *Tereancistrum parvus*
  - Trematoda
    - *Prosthenhystera obesa*
  - Copepoda
    - *Ergasilus leporinidis*
  - Branchiura
    - *Dolops striata*
  - Isopoda
    - *Lironeca guianensis*
    - *Nerocila armata*

- *Leporinus mormyrops*
  - Myxozoa
    - *Henneguya leporini*
    - *Myxobolus associatus*

- *Leporinus muyscorum*
  - Trematoda
    - *Chalcinotrema lucieni*

- *Leporinus obtusidens*
  - Trematoda
    - *Saccocoelioides magniovatus*

- *Leporinus octofasciatus*
  - Trematoda
    - *Creptotrema lynchi*
  - Isopoda
    - *Riggia brasiliensis*

- *Leporinus striatus*
  - Isopoda
    - *Riggia nana*

- *Leporinus* sp.
  - Trematoda
    - *Creptotrema creptotrema*
    - *Prosthenhystera obesa*
  - Nematoda
    - *Capillaria minima*
    - *Cucullanus mogi*
    - *Spirocamallanus amarali*
    - *iheringi*
    - *inopinatus*
    - *wrighti*
  - Branchiura
    - *Dolops striata*

- *Loricaria anus*
  - Trematoda
    - *Saccocoelioides quintus*
  - Branchiura
    - *Argulus violaceus*

- *Loricaria* sp.
  - Myxozoa
    - *Henneguya occulta*
  - Trematoda
    - *Halipegus tropicus*

- *Loricaria vetula*
  - Trematoda
    - *Procaudotestis uruguayensis*

- *Loricariichthys platymetopon*
  - Nematoda
    - *Sprentascaris mahnerti*

- Loricariidae
  - Isopoda
    - *Asotana splendida*

- *Luciopimelodus* (= *Pimelodus*) *pati*
  - Branchiura
    - *Dipteropeltis hirundo*

- *Lycengraulis grossidens*
  - Copepoda
    - *Acusicola lycengraulidis*
    - *Ergasilus euripedesi*
  - Isopoda
    - *Excorallana berbicensis*

- *Lycengraulis* sp.
  - Acanthocephala
    - *Neoechinorhynchus macronucleatus*

- *Megalodoras* sp.
  - Branchiura
    - *Dolops geayi*

- *Monochir maculipennis* (= *Achirus achirus*)
  - Acanthocephala
    - *Gracilisentis variabilis*

- *Myleus rubripinnis*
  - Isopoda
    - *Lironeca symmetrica*

- *Myleus* sp.
  - Trematoda
    - *Curumai curumai*
    - *Dadaytrema elongata*
  - Nematoda
    - *Monhysterides iheringi*
    - *Rondonia rondoni*

- *Myleus torquatus*
  - Trematoda
    - *Dadaytrema oxycephala*
  - Nematoda
    - *Rondonia rondoni*

- *Mylossoma aureum*
  - Trematoda
    - *Dadayius marenzelleri*
    - *Microrchis megacotyle*
    - *Pseudocladorchis cylindricus*
    - *nephrodorchis*

- *Mylossoma paraguayense*
  - Acanthocephala
    - *Echinorhynchus salobrense*

- *Nannostomus beckfordi*
  - Isopoda
    - *Artystone minima*

- *Odonthestes* (= *Basilichthys*) *bonariensis*
  - Branchiura
    - *Argulus violaceus*

- *Osteoglossum bicirrhosum*
  - Monogenoidea
    - *Gonocleithrum aruanae*
    - *coenoideum*
    - *cursitans*
    - *planacroideum*
    - *planacrus*
  - Trematoda
    - *Caballerotrema aruanense*
  - Nematoda
    - *Camallanus acaudatus*

- *Oxydoras kneri*
  - Nematoda
    - *Cystidicoloides vaucheri*

- *Oxydoras niger* (= *Pseudodoras niger*)
  - Monogenoidea
    - *Cosmetocleithrum confusus*
    - *gussevi*
    - *parvum*
    - *rarum*
    - *sobrinus*
  - Cestoda
    - *Proteocephalus kuyukuyu*
  - Nematoda
    - *Bacudacnitis grandistomis*
  - Acanthocephala
    - *Paracavisoma impudica*
  - Branchiura
    - *Dolops longicauda*

- *Pachyurus bonariensis*
  - Nematoda
    - *Spinitectus pachyuri*
  - Branchiura
    - *Argulus juparanaensis*

- *Pacu nigricans*
  - Acanthocephala
    - *Echinorhynchus gomezi*

- *Paulicea lütkeni*
  - Nematoda
    - *Cucullanus paulicea*
    - *schubarti*
    - *zungaro*

- *Pellona castelnaeana*
  - Copepoda
    - *Acusicola pellonidis*
  - Branchiura
    - *Dolops carvalhoi*
    - *Dolops* sp.

- *Percichthys melanops*
  - Acanthocephala
    - *Pomphorhynchus yamagutii*

- *Percichthys trucha*
  - Branchiura
    - *Argulus patagonicus*
  - Hirudinea
    - *Theromyzon propinquum*

- *Phractocephalus hemiliopterus* (= *Pirarara bicolor*)
  - Monogenoidea
    - *Urocleidoides amazonensis*
    - *catus*
    - *Vancleaveus cicinnus*
  - Cestoda
    - *Ephedrocephalus microcephalus*
    - *Myzophorus pirarara*
    - *Zygobothrium megacephalum*
  - Branchiura
    - *Dolops carvalhoi*
    - *discoidalis*

- *Piabucina* sp.
  - Nematoda
    - *Rhabdochona uruyeni*

- *Piaractus brachypomus* (= *Colossoma bidens*)
  - Ciliophora
    - *Nyctotherus piscicola*
  - Nematoda
    - *Monohysterides iheringi*
    - *Rondonia rondoni*
    - *Spectatus spectatus*
  - Acanthocephala
    - *Echinorhynchus jucundum*

- *Pimelodella lateristriga*
  - Nematoda
    - *Rhabdochona acuminata*
    - *Spinitectus rudolphiheringi*
    - *yorkei*
    - *Spirocamallanus rarus*
    - *Contracaecum* sp. (larvae)

- *Pimelodella* sp.
  - Myxozoa
    - *Myxobolus stokesi*
  - Nematoda
    - *Spinitectus multipapillata*

- Pimelodidae
  - Acanthocephala
    - *Acanthodelta scorzai*

- *Pimelodus albicans*
  - Myxozoa
    - *Myxobolus* sp.
  - Branchiura
    - *Argulus violaceus*

- *Pimelodus clarias*
  - Myxozoa
    - *Myxobolus cunhai*
    - *inaequalis*
  - Ciliophora
    - *Balantidium piscicola*
    - *Nyctotherus piscicola*
    - *Zelleriella piscicola*
  - Trematoda
    - *Crepidostomum platense*
    - *Halipegus tropicus*
    - *Parspina argentinensis*
  - Nematoda
    - *Agamonema* sp. (larvae)
    - *Cucullanus pinnai*
    - *Eustrongylides* sp. (larvae)
    - *Philometra baylisi*
    - *Rondonia rondoni*
    - *Spirocamallanus intermedius*
    - *pimelodus*
  - Isopoda
    - *Telotha henselii*

- *Pimelodus grosskopfii*
  - Monogenoidea
    - *Urocleidoides lebedevi*

- *Pimelodus maculatus*
  - Nematoda
    - *Spinitectus sternopygi*
    - *Sprentascaris pimelodi*

- *Pimelodus megacephalus*
  - Trematoda
    - *Dadaytrema oxycephala*
    - *Pseudocladorchis cylindricus*

- *Pimelodus ornatus*
  - Trematoda
    - *Pseudocladorchis cylindricus*

- *Pimelodus ortmanni*
  - Nematoda
    - *Spirocamallanus intermedius*

- *Pimelodus* (= *Luciopimelodus*) *pati*
  - Cestoda
    - *Monticellia piracatinga*
    - *Nominoscolex piracatinga*
    - *Proteocephalus fossatus*
    - *Rudolphiella lobosa*
  - Branchiura
    - *Dipteropeltis hirundo*

- *Pimelodus* sp.
  - Myxozoa
    - *Myxobolus stokesi*

- *Pinirampus pirinampu*
  - Monogenoidea
    - *Omothecium pinirampi*
    - *luckyi*
  - Cestoda
    - *Myzophorus admonticellia*
    - *Rudolphiella myoides*
    - *piranabu*
  - Nematoda
    - *Agamonema* sp. (larvae)

- *Pirarara bicolor* (= *Phractocephalus hemioliopterus*
  - Cestoda
    - *Zygobothrium megacephalum*

- *Plagioscion* sp.
  - Monogenoidea
    - *Diplectanum hilum*

- *Plagioscion squamosissimus*
  - Monogenoidea
    - *Diplectanum decorum*
    - *gymnopeus*
    - *pescadae*
    - *piscinarius*
  - Trematoda
    - *Brasicystis bennetti*
  - Acanthocephala
    - *Rhadinorhynchus plagioscionis*
  - Copepoda
    - *Amazonicopeus elongatus*
  - Branchiura
    - *Dolops* sp.

- *Platystoma* sp. (= *Sorubim lima*)
  - Cestoda
    - *Manaosia bracodemoca*

- *Platystomatichthys sturio*
  - Cestoda
    - *Monticellia megacephala*
    - *Nominoscolex lenha*
    - *Ornithoscolex lenha*
    - *Peltidocotyle lenha*
    - *Spasskyellina lenha*
    - *Woodlandiella myzophora*

- *Pleuronectes* sp.
  - Acanthocephala
    - *Gracilisentis variabilis*

- *Poecilia reticulata*
  - Monogenoidea
    - *Urocleidoides minuta*
    - *reticulatus*

- *Poecilia sphenops*
  - Monogenoidea
    - *Gyrodactylus bullatarudis*
    - *costaricensis*

- *Poecilia vivipara*
  - Myxozoa
    - *Myxobolus lutzi*

- *Potamotrygon circularis*
  - Monogenoidea
    - *Paraheteronchocotyle amazonensis*
    - *Potamotrygonocotyle tsalickisi*
  - Cestoda
    - *Acanthobothrium amazonensis*
    - *Potamotrygonocestus amazonensis*
    - *Rhinebothroides circularisi*
  - Nematoda
    - *Echinocephalus daileyi*

- *Potamotrygon falkneri*
  - Cestoda
    - *Eutetrarhynchus araya*
    - *Rhinebothrium paratrygoni*

- *Potamotrygon histrix*
  - Cestoda
    - *Acanthobothrium regoi*
    - *Eutetrarhynchus araya*
    - *Rhinebothrium paratrygoni*
    - *Rhinebothroides freitasi*
    - *glandularis*
    - *venezuelensis*
  - Nematoda
    - *Echinorhynchus daileyi*
  - Acanthocephala
    - *Megapriapus ungriai*

- *Potamotrygon magdalenae*
  - Cestoda
    - *Acanthobothrium quinonesi*
    - *Potamotrygonocestus magdalenensis*
    - *Rhinebothroides moralarai*
    - *scorzai*

- *Potamotrygon motoro*
  - Cestoda
    - *Acanthobothrium terezae*
    - *Eutetrarhynchus araya*
    - *Rhinebothroides scorzai*

- *Potamotrygon reticulatus*
  - Cestoda
    - *Eutetrarhynchus araya*
    - *Potamotrygonocestus amazonensis*
    - *orinocoensis*
    - *Rhinebothrium paratrygoni*
    - *Rhinebothroides scorzai*

- *Potamotrygon yepezi*
  - Cestoda
    - *Potamotrygonocestus amazonensis*
    - *Rhinebothroides venezuelensis*

- *Pristis perotteti*
  - Cestoda
    - *Anthobothrium pristis*

- *Prochilodus lineatus*
  - Trematoda
    - *Saccocoelioides nanii*

- *Prochilodus nigricans*
  - Monogenoidea
    - *Rhinonastes pseudocapsaloideum*
  - Branchiura
    - *Argulus* sp.
    - *Dolops bidentata*
    - *Dolops* sp.

- *Prochilodus platensis*
  - Trematoda
    - *Sanguinicola argentinensis*

- *Prochilodus reticulatus*
  - Monogenoidea
    - *Anacanthoroides mizellei*
  - Trematoda
    - *Colocladorchis ventrastomis*
    - *Lecithobotrioides mediacanoensis*
    - *Unicoelium prochilodorum*
  - Nematoda
    - *Spinitectus jamundensis*
  - Acanthocephala
    - *Neoechinorhynchus prochilodorum*

- *Prochilodus scrofa*
  - Nematoda
    - *Spinitectus asperus*

- *Pseudauchenipterus nodosus*
  - Isopoda
    - *Nerocila armata*

- *Pseudocurimata* (= *Cyphocharax*) *plumbea*
  - Nematoda
    - *Travnema travnema*

- *Pseudodoras niger*
  - Acanthocephala
    - *Paracavisoma impudica*

- *Pseudopimelodus roosevelti*
  - Trematoda
    - *Iheringtrema iheringi*

- *Pseudopimelodus* (= *Cephalosilurus*) *zungaro*
  - Myxozoa
    - *Henneguya lutzi*
  - Monogenoidea
    - *Phanerothecium caballeroi*
    - *Urocleidoides mamaevi*
  - Trematoda
    - *Prosthenhystera obesa*
  - Cestoda
    - *Amphoteromorphus parkarmoo*
  - Nematoda
    - *Cucullanus zungaro*

- *Pseudoplatisma* sp.
  - Monogenoidea
    - *Amphocleithrium paraguayensis*

- *Pseudoplatystoma coruscans*
  - Branchiura
    - *Argulus silvestrii*

- *Pseudoplatystoma fasciatum*
  - Myxozoa
    - *Henneguya linearis*
  - Cestoda
    - *Monticellia rugosa*
    - *Myzophorus sorobim*
    - *Nominoscolex sorobim*
    - *woodlandi*
    - *Spasskyellina spinulifera*
  - Branchiura
    - *Argulus juparanaensis*
    - *pestifer*
    - *Argulus* sp.
    - *Dolops carvalhoi*
    - *discoidalis*
    - *Dolops* sp.

- *Pseudoplatystoma tigrinum*
  - Monogenoidea
    - *Vancleavius fungulus*
  - Trematoda
    - *Witenbergia witenbergia*
  - Cestoda
    - *Monticellia surubim*
    - *Nominoscolex kaparari*
    - *Peltidocotyle rugosa*
  - Branchiura
    - *Argulus pestifer*
    - *Dolops carvalhoi*
    - *discoidalis*

- *Pseudoplatystoma* sp.
  - Cestoda
    - *Monticellia surubim*
    - *Proteocephalus platystomi*
  - Nematoda
    - *Cucullanus pinnae*
    - *Contracaecum* sp. (larvae)
    - *Eustrongylides* sp. (larvae)
  - Branchiura
    - *Argulus nattereri*

- *Pseudotylosurus angusticeps*
  - Copepoda
    - *Acusicola cunula*

- *Pterodoras granulosus*
  - Monogenoidea
    - *Cosmetocleithrum bulbocirrus*
    - *Vancleavius janauacaensis*
  - Trematoda
    - *Dadaytrema oxycephala*
    - *Pseudocladorchis cylindricus*
    - *ferrumequinum*

  - Nematoda
    - *Rondonia rondoni*
  - Acanthocephala
    - *Neoechinorhynchus pterodoridis*
  - Branchiura
    - *Dolops longicauda*

- *Pterophyllum scalare*
  - Monogenoidea
    - *Gussevia spiralocirrus*
    - *Sciadicleithrum iphthimum*

- *Pterygoplichthys pardalis*
  - Trematoda
    - *Megacoelium spinicavum*

- *Pterygoplichthys* sp.
  - Trematoda
    - *Megacoelium spinispecum*

- *Pygidium* (= *Trichomycterus*) *brasiliensis*
  - Nematoda
    - *Spirocamallanus pexatus*

- *Pygidium* (= *Trichomycterus*) *punctatum*
  - Nematoda
    - *Spirocamallanus chimusensis*
    - *incarocai*

- *Pygocentrus* sp.
  - Nematoda
    - *Spirocamallanus wrighti*

- *Rhamdia guatemalensis*
  - Nematoda
    - *Dujardinascaris cenotae*
    - *Rhabdochona kidderi*
  - Branchiura
    - *Argulus rhamdiae*

- *Rhamdia quelen*
  - Myxozoa
    - *Henneguya* sp.
    - *Myxobolus* sp.
  - Monogenoidea
    - *Urocleidoides travassosi*
  - Trematoda
    - *Acanthostomum gnerii*
  - Branchiura
    - *Argulus violaceus*

- *Rhamdia rogersi*
  - Monogenoidea
    - *Urocleidoides chavarriai*
  - Trematoda
    - *Acanthostomum gnerii*

- *Rhamdia sapo*
  - Monogenoidea
    - *Urocleidoides chavarriai*
  - Hirudinea
    - *Myzobdella uruguayensis*
  - Branchiura
    - *Argulus violaceus*

- *Rhamdia sebae*
  - Myxozoa
    - *Henneguya linearis*
  - Monogenoidea
    - *Urocleidoides chavarriai*
    - *travassosi*

- *Rhamdia* sp.
  - Monogenoidea
    - *Urocleidoides robustus*
    - *travassosi*
  - Cestoda
    - *Megathylacus jandia*
    - *Proteocephalus jandia*
  - Branchiura
    - *Argulus chromidis*

- *Rhaphiodon vulpinus*
  - Nematoda
    - *Agamonema* sp. (larvae)
  - Branchiura
    - *Argulus multicolor*
    - *Dolops carvalhoi*

- *Rhinodoras d'orbignyi*
  - Trematoda
    - *Paleocryptogonimus claviformis*
  - Nematoda
    - *Spirocamallanus rarus*

- *Rhytiodus argenteofuscus*
  - Monogenoidea
    - *Rhinoxenus arietinus*

- *Rhytiodus microlepis*
  - Monogenoidea
    - *Urocleidoides paradoxus*
  - Branchiura
    - *Argulus* sp.
    - *Dolops bidentata*

- *Rivulus harti*
  - Monogenoidea
    - *Cycloplectanum americanum*

- *Roeboides bonariensis*
  - Trematoda
    - *Crepidostomum macrorchis*
    - *Halipegus genarchella*

- *Saccodon caucae*
  - Trematoda
    - *Saccocoelioides magnorchis*
    - *saccodontis*

- *Salminus affinis*
  - Monogenoidea
    - *Anacanthorus colombianus*
    - *cuticulovaginus*

- *Salminus brevidens*
  - Trematoda
    - *Prosthenhystera obesa*
  - Nematoda
    - *Agamonema* sp. (larvae)
  - Copepoda
    - *Taurocheros salminisii*
  - Branchiura
    - *Argulus nattereri*
    - *salmini*
    - *Dipteropeltis hirundo*
    - *Dolops longicauda*

- *Salminus hilarii*
  - Trematoda
    - *Bellumcorpus major*
    - *Cladocystis intestinalis*
    - *Pararhipidocotyle jeffersoni*
    - *Prosorhynchus costai*
  - Nematoda
    - *Philometra maplestonei*
    - *Spinitectus rudolphiheringi*
    - *Spirocamallanus hilarii*
    - *iheringi*
  - Isopoda
    - *Braga patagonica*

- *Salminus maxillosus*
  - Trematoda
    - *Cladocystis intestinalis*
    - *Dadaytrema oxycephala*
    - *Halipegus dubius*
    - *Pararhipidocotyle jeffersoni*
    - *Prosorhynchus schubarti*
    - *Prosthenhystera obesa*
  - Nematoda
    - *Capillaria maxillosa*
    - *Cucullanus interrogativus*
    - *Cystidicoloides fischeri*
    - *Eustrongylides* sp. (larvae)
  - Branchiura
    - *Argulus paranensis*
    - *paulensis*
    - *pestifer*
    - *salmini*
    - *Dipteropeltis hirundo*
    - *Dolops discoidalis*
    - *geayi*
    - *longicauda*
    - *nana*

- *Scatophagus argus*
  - Monogenoidea
    - *Metahaliotrema scatophagi*
    - *yamagutii*

- *Schizodon fasciatus*
  - Monogenoidea
    - *Rhinoxenus arietinus*
    - *nyttus*
  - Trematoda
    - *Saccocoelioides szidati*
  - Acanthocephala
    - *Octospiniferoides incognita*
  - Copepoda
    - *Gamispatulus schizodontis*
  - Branchiura
    - *Dolops striata*

- *Schizodon nasutum*
  - Isopoda
    - *Riggia brasiliensis*

- *Semaprochilodus insignis*
  - Copepoda
    - *Brasergasilus jaraquensis*
    - *Ergasilus jaraquensis*
    - *Gamidactylus jaraquensis*

- *Serrasalmus* (= *Pygocentrus*) *nattereri*
  - Monogenoidea
    - *Amphithecium brachycirrum*
    - *calycinum*
    - *camelum*
    - *catalaoensis*
    - *falcatum*
    - *junki*

    - *Anacanthorus anacanthorus*
      - *brazilensis*
      - *maltai*
      - *neotropicalis*
      - *reginae*
      - *rondonensis*
      - *thatcheri*
    - *Cleidodiscus amazonensis*
      - *piranhus*
      - *serrasalmus*
    - *Notothecium aegidatum*
      - *mizellei*
    - *Notozothecium penetrarum*
      - *minor*
    - *Urocleidus crescentis*
      - *orthus*
  - Nematoda
    - *Spirocamallanus inopinatus*
  - Copepoda
    - *Rhinergasilus piranhus*
  - Branchiura
    - *Argulus multicolor*
    - *Argulus* sp.
    - *Dolops bidentata*
      - *carvalhoi*
      - *longicauda*

- *Serrasalmus* (= *Pygocentrus*) *piraya*
  - Myxozoa
    - *Myxobolus cunhai*
      - *pygocentris*
  - Nematoda
    - *Agamonema* sp. (larvae)
  - Branchiura
    - *Dipteropeltis hirundo*

- *Serrasalmus rhombeus*
  - Myxozoa
    - *Myxobolus serrasalmi*
  - Isopoda
    - *Lironeca symmetrica*

- *Serrasalmus spilopleura*
  - Myxozoa
    - *Henneguya iheringi*
    - *Myxobolus noguchii*

- *Serrasalmus* sp.
  - Isopoda
    - *Asotana magnifica*
    - *Lironeca symmetrica*

- *Silurus palmito* (= *Ageneiosus* sp.)
  - Trematoda
    - *Microrchis megacotyle*

- *Silurus* sp.
  - Cestoda
    - *Choanoscolex abscisus*
    - *Monticellia coryphicephala*

- *Sorubim lima* (see *Platystoma* sp.)
  - Monogenoidea
    - *Urocleidoides megarchis*

- *Sphaeroides testudineus*
  - Ciliophora
    - *Trichodina fariai*

- *Stenarchus* (= *Apteronotus*) *brasiliensis*
  - Isopoda
    - *Telotha lunaris*

- *Sternopygus macrurus*
  - Nematoda
    - *Cystidicoloides dlouhyi*
    - *Spinitectus sternopygi*

- *Strongylura fluviatilis*
  - Copepoda
    - *Ergasilus argulus*

- *Strongylura scapularis*
  - Copepoda
    - *Ergasilus argulus*

- *Strongylura* sp.
  - Copepoda
    - *Acusicola tenax*

- *Symphysodon discus*
  - Monogenoidea
    - *Sciadicleithrum variabilum*

- *Synbranchus marmoratus*
  - Nematoda
    - *Agamonema* sp. (larvae)
  - Acanthocephala
    - *Quadrigyrus torquatus*
  - Branchiura
    - *Dolops striata*

- *Tetragonopterus* sp.
  - Nematoda
    - *Rhabdochona elegans*
    - *Spirocamallanus iheringi*

- *Tilapia mossambica*
  - Monogenoidea
    - *Cichlidogyrus sclerosus*
      - *tilapiae*

- *Triportheus angulatus*
  - Acanthocephala
    - *Palliolisentis quinqueungulis*

- *Triportheus elongatus*
  - Branchiura
    - *Dolops* sp.

- *Triportheus paranensis*
  - Trematoda
    - *Chalcinotrema salobrensis*
    - *Creptotrema dispar*
  - Nematoda
    - *Spinitectus sternopygi*
  - Acanthocephala
    - *Echinorhynchus paranense*
    - *Palliolisentis ornatus*
      - *quinqueungulis*

- *Triportheus* sp.
  - Nematoda
    - *Spirocamallanus barroslimai*

- *Typhlias pearsei*
  - Nematoda
    - *Rhabdochona kidderi*

- *Uaru amphiacanthoides*
  - Monogenoidea
    - *Gussevia elephus*
      - *obtusa*
    - *Sciadicleithrum tortrix*

- *Xiphostomum* (= *Boulengerella*) *cuvieri*
  - Trematoda
    - *Prosthenhystera obesa*